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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Application for Jerry R. Smith

Title: **ELECTROMECHANICAL SWITCHING DEVICE**
Serial No.: 09/202,003
Filed: December 7, 1998
Action: **PETITION UNDER 37 C.F.R. §1.181(a)(3) TO TRANSMIT A
NOTIFICATION OF ACCEPTANCE OF APPLICATION UNDER 35
U.S.C. §371 AND FOR PROMPT EXAMINATION OF NATIONAL
STAGE APPLICATION**

To: Attention: Box PCT Legal Department
The Assistant Commissioner for Patents
Washington, DC 20231

RECEIVED

01 DEC 2000

Legal Staff

Dear Sir:

Applicant and Petitioner, Jerry R. Smith, through his attorneys, Timothy J. Martin, P.C., hereby petitions the Commissioner pursuant to 37 C.F.R. §1.181(a)(3) to transmit a Notification of Acceptance of Application under 35 U.S.C. §371 and for prompt examination respecting the above-identified National stage application. As grounds therefor, Applicant/Petitioner states as follows:

I. BACKGROUND EVENTS LEADING UP TO THE PRESENT PETITION

The present Petition and its accompanying Attachment 1 (Affidavit of Christy L. Burbank with Exhibits A-F) pertains to the lengthy delay in receiving from the USPTO either a Notification of Acceptance or any examination pertaining to a National stage application properly filed under 35 U.S.C. §371, believed to be identified in the USPTO by Serial No. 09/202,003. In rendering its decision in this matter, it is respectfully requested that the Commissioner consider the following circumstances which have lead up to the present petition.

On July 9, 1996, Applicant/Petitioner filed US Provisional Application No. 60/021,435 relating to an Electromechanical Switching Device. Subsequently, on July 9, 1997, a Request was filed under the provisions of the Patent Cooperation Treaty (PCT) for an International application entitled "Electromechanical Switching Device" and claiming the benefit of U.S. provisional application Serial No. 60/021,435.¹ This International application, which became identified as International Application No. PCT/US97/12310, specifically designated the United States of America, as well as other states and a Regional patent in Europe. The International Search Authority (ISA) subsequently mailed the International Search Report on November 12, 1997.² A Demand for Preliminary Examination was also made under Article 31 of the PCT, which Demand was timely transmitted on January 9, 1998.³ In the Demand, Applicant elected all eligible states (including the U.S.) as indicated by Check Box V on page 2 of the Demand transmittal papers. The U.S. Receiving Office, acting as the International Preliminary Examining Authority (IPEA), subsequently mailed the International Preliminary Examination Report on April 13, 1998⁴, and the corresponding International application was published on January 15, 1998 as International Publication No. WO 98/01928.⁵

Subsequently, on December 7, 1998, and prior to the expiration of 30 months from the priority date, Applicant/Petitioner entered the National Phase in the United States by filing his National Stage application under the provisions of

¹ See Exh. A to Burbank Affidavit (Attachment 1)

² *Id.*

³ *Id.* Exh. B

⁴ *Id.*

35 U.S.C. §371.⁶ Applicant/Petitioner also filed corresponding National Stage applications in certain other elected territories, including Europe, Australia, Canada, Brazil and Japan. Accompanying the filing papers for the U.S. National Stage application was a postcard which was date stamped as received by the PCT/PTO on December 7, 1998.⁷ Curiously, though, the return postcard did not reflect that a serial number had been assigned to the U.S. National application. When it came time to transmit Applicant's Information Disclosure Statement (IDS), the undersigned representative for the Applicant reviewed the file jacket for this U.S. National stage application and noticed that a serial number had still not been assigned to the application, nor had a Notification of Acceptance been transmitted by the USPTO. Accordingly, the undersigned instructed his secretary, Christy L. Burbank, to make inquiries with the USPTO regarding the status of this application and particularly to determine what serial number, if any, had been assigned to the application so that it could be properly identified in the IDS. Ms. Burbank accordingly contacted Annette Short at the USPTO and was informed by Ms. Short that the serial number for this application is 09/202,003. This information was obtained from Ms. Short on February 16, 1999, approximately three month after entering the National Stage in the United States.⁸ Applicant's IDS was subsequently transmitted on March 1, 1999 and received by the PCT/PTO on March 4, 1999.⁹

⁵ *Id.*

⁶ *Id.*, Exh. C.

⁷ *Id.*, Exh. D.

⁸ *Id.*, Exh. E.

⁹ *Id.*, Exh. F.

In August of this year, shortly after Applicant's representative began to receive communications from foreign patent offices concerning examination of corresponding national stage applications pending in other countries, it was realized upon another review of the file jacket for the U.S. application that, not only had substantive examination not begun in this case, but the USPTO had still not transmitted a Notification of Acceptance for this application. Ms. Burbank again made numerous inquiries with various individuals at the USPTO as reflected by her telephone logs recorded on August 31, 2000, September 22, 2000, September 29, 2000, and most recently on October 19, 2000. Initially, as reflected in her telephone logs dated August 31, 2000 and September 22, 2000, Ms. Burbank was informed that, while there did not appear to be a problem with the application, representatives of the PTO (specifically, the PCT Help Desk) could not understand why a Notification of Acceptance had not been mailed.¹⁰ After numerous attempts to resolve this matter, Ms. Burbank was ultimately informed by Mr. Tony Smith at the USPTO on October 19, 2000 that the only available recourse to have this matter resolved was to file a Petition under 37 C.F.R. §1.181. Mr. Smith specifically indicated that the USPTO was in error for not sending the Notification of Acceptance.¹¹

In any event, and after becoming aware of additional art cited in communications from one or more foreign patent offices and counterpart foreign applications, Applicant's representative recently submitted a First Supplemental

¹⁰ *Id.*, Exh. E.

¹¹ *Id.*

Information Disclosure on November 14, 2000.¹² As of the filing of this Petition, now almost two years after entering the U.S. National Stage, Applicant/Petitioner has still yet to receive any written communications from the USPTO pertaining to this application, namely, either a Notification of Acceptance or an Office Action on the merits. The most that can be determined at this point based on inquiries made to the Help Desk at the USPTO is that the application papers were for some reason forwarded back to the PCT division. It is the non-receipt of any Notification of Acceptance or Office Action over such a prolonged period of time which has prompted the filing of the present Petition.

II. PROVISIONS GOVERNING THE PRESENT PETITION

Petitions to the Commissioner are governed by 37 C.F.R. §1.181 which lists three situations in which a Petition may be taken to the Commissioner. A first of these situations arises “[f]rom any action or requirement of any Examiner in the *ex parte* prosecution of an application which is not subject to appeal to the Board of Patent Appeals and Interferences or the Court.” 37 C.F.R. §1.181(a)(1). Another situation arises “[i]n cases in which a statute or the rules specify that the matter is to be determined directly by or reviewed by the Commissioner”. 37 C.F.R. §1.181(a)(2). A third situation in which a Petition is appropriate is “[t]o invoke the supervisory authority of the Commissioner in appropriate circumstances.” 37 C.F.R. §1.181(a)(3). Applicant/Petitioner believes that the present Petition most appropriate falls under the provisions of this third circumstance in 37 C.F.R. §1.181(a)(3).

¹² *Id.*, Exh. G.

While M.P.E.P. §1002(b) – (s) identifies a variety of specific petitionable matters which are assignable to particular authorities at the USPTO, Applicant's representative has been unable to identify any therein which particularly correspond to the present circumstances. Accordingly, this Petition is being made to invoke the supervisory authority of the Commissioner under 37 C.F.R. §1.181, and may also be interpreted as being submitted under 37 C.F.R. §1.182 as it pertains to "Questions not specifically provided for". Since it appears this Petition pertains to a situation not specifically provided for in the regulations, it is accompanied by the petition fee set forth in 37 C.F.R. §1.17(h).¹³

Applicant/Petitioner is aware of the provisions of 37 C.F.R. §1.181(f) which provides that any Petition not filed within two months of the action complained of may be dismissed as untimely. However, since there does not appear to have been any action from the USPTO respecting this U.S. National Stage application, it is maintained that 37 C.F.R. §1.181(f) is inapplicable.

III. THE USPTO SHOULD PROCEED PROMPTLY TO FORWARD TO APPLICANT'S REPRESENTATIVE A NOTIFICATION OF ACCEPTANCE AS WELL AS AN OFFICE ACTION ON THE MERITS

Given the peculiar circumstances involved in this case, the Commissioner is respectfully requested to instruct the appropriate authorities at the USPTO to promptly transmit a Notification of Acceptance for Applicant/Petitioner's U.S. National Stage application, as well as any appropriate Office Action on the merits. The attached affidavit of Ms. Burbank (Attachment 1) is submitted as evidence of the various circumstances which have developed (as cronologized in

¹³ However, in the event the Commissioner determines that a fee is not required to accompany the present Petition, the Commissioner is respectfully requested to

section I, above) pertaining to this Petition. It is believed, particularly since there has been no transmission of a Notification of Acceptance since December 1998, either that (1) the filing papers for the U.S. National Stage application have been misplaced; or (2) they were inadvertently forwarded to an improper division of the USPTO. In any event, it is urged that this matter be resolved in a timely fashion.

Also in consideration for a prompt resolution of this matter, the Commissioner might also take into consideration that there is at least one outstanding licensing agreement which Applicant/Petitioner has made with a third party involving this U.S. National Stage application. More specifically, the payment terms to Applicant/Petitioner may be impacted to the disadvantage of Applicant/Petitioner in the event that a United States patent fails to issue in the very near future. While it is appreciated that there can be no guarantee that a United States patent application will ultimately issue in the United States directed to Applicant's Electromechanical Switching Device, equitable interests dictate against any further prosecution delays respecting this application.

CONCLUSION

Based on the foregoing, it is respectfully requested that the Commissioner grant this Petition and cause both a Notification of Acceptance and an Office Action on the merits to be transmitted forthwith relating to this application.

credit any overpayment to Deposit Account No. 13-1940.

Respectfully submitted,

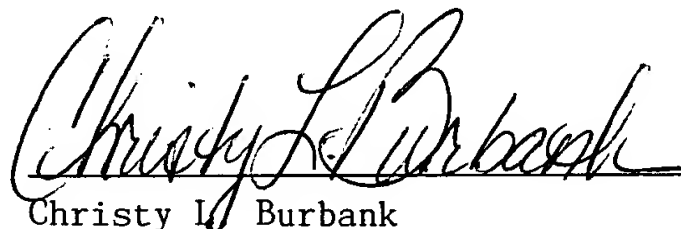
TIMOTHY J. MARTIN, P.C.



Timothy J. Martin, #28,640
Michael R. Henson, #39,222
Mark H. Weygandt, #43,260
9250 W. 5th Avenue, Suite 200
Lakewood, Colorado 80226
(303) 232-3388

CERTIFICATE OF EXPRESS MAILING UNDER 37 C.F.R. 1.10

I hereby certify that the foregoing **PETITION UNDER 37 C.F.R. §1.181(a)(3) TO TRANSMIT A FILING RECEIPT AND FOR PROMPT EXAMINATION OF NATIONAL STAGE APPLICATION FILED UNDER 35 U.S.C. §371** are being deposited with the United States Postal Service as Express Mail label no. EK 742445968 US addressed to Attention: Box PCT Legal Department, The Assistant Commissioner for Patents, Washington, DC 20231 on this 27th day of November, 2000.



Christy L. Burbank

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Application for Jerry R. Smith

Title: **ELECTROMECHANICAL SWITCHING DEVICE**

Serial No.: 09/202,003

Filed: December 7, 1998

Action: ***AFFIDAVIT OF CHRISTY L. BURBANK***

To: Attention: Box PCT Legal Department
The Assistant Commissioner for Patents
Washington, DC 20231

Dear Sir:

1. My name is Christy L. Burbank and I have been employed with the law firm of Timothy J. Martin, P.C. located at 9250 W. 5th Avenue, Suite 200, Lakewood, Colorado 80226 for approximately four (4) years. Since about June 1998 I have held the position of Legal Secretary to Michael R. Henson, the attorney responsible for handling the above-identified application.

2. I have first hand knowledge of the facts stated herein.

3. On July 9, 1997 I personally deposited with the United States Postal Service under the provisions of 37 C.F.R. §1.10 a PCT Request for an International application to an invention entitled "Electromechanical Switching Device", on behalf of the Applicant Jerry R. Smith. A true and correct copy of the transmittal papers for this request for International application under the provisions of the Patent Cooperation Treaty (PCT) is attached hereto as Exhibit A.

4. Also attached hereto as Exhibit A are true and correct copies of various correspondences received from both the International Bureau and the

United States Receiving Office concerning this International application which came to be identified as International Applicant No. PCT/US97/12310. These correspondences include, *inter alia*, the following items:

- (1) Notification of Receipt of Record Copy;
- (2) Notification Concerning Submission of Priority Documents; and
- (3) Notification of Transmittal of the International Search Report or the Declaration.

5. Attached hereto as Exhibit B is a true and correct copy of the transmittal papers for the PCT Demand concerning this application, which I deposited with the United States Postal Service on January 9, 1998.

6. Also attached hereto as Exhibit B are true and correct copies of various correspondences received after submitting the Demand including, *inter alia*:

- (1) Notification of Receipt of Demand; and
- (2) Notification of Transmittal of International Preliminary Examination Report; and
- (3) WIPO Publication No. WO 98/01928.

7. Attached hereto as Exhibit C are true and correct copies of the transmittal papers for the corresponding United States National application filed under 35 U.S.C. §371.

8. Attached hereto as Exhibit D is a true and correct copy of a postcard reflecting receipt of the U.S. National application transmittal papers by the PCT/PTO on December 7, 1998. Also appearing on this Exhibit D is a

notation in my handwriting which states "Serial No. 09/202,003". To the best of my recollection, this notation was made by me on or about March 1, 1999 concurrently with a telephone conversation I had with Annette Short at the USPTO. I have reason to believe the notation was made on or about that date because it corresponds to the date in which the initial Information Disclosure Statement in this case was filed by Mr. Henson. I recall Mr. Henson specifically requesting that I make inquiries with the USPTO in an effort to ascertain the serial number for this application so that the proper serial number could be identified on the Information Disclosure Statement, a copy of which is attached as Exhibit F hereto. Also attached as Exhibit F is a true and correct copy of a return postcard reflecting receipt of the Information Disclosure Statement by the PCT/PTO on March 4, 1999.

9. Attached hereto collectively as Exhibit E are true and correct copies of various telephone logs created by me on February 16, 1999, August 31, 2000, September 22, 2000, September 29, 2000 and October 19, 2000. Each of these telephone logs bears notations of mine recorded during telephone calls with various individuals at the USPTO when I was inquiring further into the status of the U.S. National Stage application for Mr. Smith.

10. Finally, attached hereto as Exhibit G is a true and correct copy of the transmittal papers for a First Supplemental Information Disclosure Statement for this application, which was deposited by me with the United States Postal Service on November 14, 2000.

11. In response to my various inquiries with the USPTO over the last two years concerning the status of this application, I have been informed that this application has been identified in the USPTO by Serial No. 09/202,003. I have also been informed, as evidenced by the telephone logs attached as Exhibit E, that, for unknown reasons, a Notification of Acceptance has not been mailed out concerning this application. I have also been informed by Mr. Tony Smith at the USPTO that it is his belief that, also for some unknown reason, the paperwork concerning this application appears to have been forwarded to the PCT section of the USPTO and that our only recourse at this point to expedite prosecution of this application is to file an appropriate Petition under 37 C.F.R. §1.181.

Further affiant sayeth not.

Dated: November 27, 2000 By: Christy L. Burbank
Christy L. Burbank

State of Colorado)
) ss.
County of Jefferson)

Before me, a Notary Public in and for the said County and State, personally appeared **CHRISTY L. BURBANK** who is known to me to be the person whose name is subscribed to the foregoing instrument, and who acknowledged to me that she executed the same for the purposes and considerations therein expressed.

Ann R. Carls
Notary Public

9250 W. 5th Avenue, Suite 200
Lakewood, Colorado 80226

(SEAL)

My Commission Expires:

Sept 26, 2004

PCT INTERNATIONAL APPLICATION TRANSMITTAL LETTER	DATE JULY 9, 1997
REGARDING THE INTERNATIONAL APPLICATION OF Jerry R. Smith	DOCKET OR REFERENCE NUMBER ON 1627
ENTITLED ELECTROMECHANICAL SWITCHING DEVICE	

Certification under 37 CFR 1.10 (if applicable)

EI 051035953 US

"Express Mail" mailing number

I hereby certify that this application is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to the Commissioner of Patents and Trademarks, Washington, D.C. 20231.

CHRISTY L. BURBANK

(Typed or printed name of person mailing application)

July 9, 1997
Date of Deposit

(Signature of person mailing application)

To the United States Receiving Office (RO/US):

Accompanying this transmittal letter is the above-identified International application, including a completed Request form (PCT/RO/101). Please process the application according to the provisions of the Patent Cooperation Treaty.

The following requests are made of the RO/US:

1. ☒ PREPARATION AND TRANSMITTAL OF CERTIFIED COPY OF PRIORITY DOCUMENTS—Please prepare and transmit to the International Bureau a certified copy of the United States origin priority documents identified in Box VI of the Request form (37 CFR 1.451).

To cover the cost of copy preparation and certification (37 CFR 1.19(a)(3) and (b)(1)).

- ☒ a (check) (money order) in the amount of \$ 2111.00 is attached to this transmittal letter. INCLUDED IN FILING FEES
- ☐ the RO/US is hereby authorized to charge the following deposit account no.: _____

2. ☒ CHOICE OF INTERNATIONAL SEARCHING AUTHORITY—It is requested that the International Search be performed by the following International Searching Authority:

☒ United States Patent and Trademark Office (ISA/US)

☐ European Patent Office (ISA/EP)

The appropriate Search fee for the above-named Authority is indicated on the Fee Calculation Sheet (PCT/RO/101 Annex).

3. ☒ SUPPLEMENTAL SEARCH FEES (ONLY WHEN ISA/US CONDUCTS THE INTERNATIONAL SEARCH.)—Please charge any Supplemental Search fees that may be required by the United States International Searching Authority (ISA/US) to deposit account no.: _____

I understand that this authorization is subject to my oral confirmation thereof in each instance and that it in no way limits my right to submit a protest against payment of the Supplemental Search fees, but is merely an administrative aid to assure that the ISA/US may timely complete the Search Report.

NOTE: SUPPLEMENTAL SEARCH FEES FOR ISA/EP ARE PAYABLE DIRECTLY TO THE EUROPEAN PATENT OFFICE

4. ☒ DISCLOSURE INFORMATION—In order to assist in screening the accompanying International application for purposes of determining whether a license for foreign transmittal should and could be granted and for other purposes, the following information is supplied:

A. ☐ There is no prior filed application relating to this invention.

B. ☒ There is a prior application, serial number 60/021,435 filed on JULY 9, 1996 which contains subject matter that is


1. ☐ substantially identical to that of the accompanying International application.

2. ☒ less than that of the accompanying International application. The additional subject matter of the International application appears on page(s) and line(s) _____.

3. ☐ more than that of the accompanying International application.

C. ☐ Disclosure information cannot be covered by the language of Points 4A or 4B above due to the involvement of several prior applications or for other reasons. A separate sheet on which the disclosure information is explained is attached to this transmittal letter.

5. ☒ REQUEST FOR FOREIGN TRANSMITTAL LICENSE—According to the provisions of 35 U.S.C. 184 and 37 CFR 5.11, a license to transmit the accompanying International application to foreign agencies or international authorities is hereby requested.

SIGNER IS THE <input type="checkbox"/> APPLICANT <input type="checkbox"/> COMMON REPRESENTATIVE <input checked="" type="checkbox"/> ATTORNEY/AGENT REG. NO. 28,640	NAME OF SIGNER (typed) Timothy J. Martin
	SIGNATURE 

PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receipt Office use only

International Application No.

International Filing Date

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference
(if desired) (12 characters maximum)

DN 1627

Box No. I TITLE OF INVENTION

ELECTROMECHANICAL SWITCHING DEVICE

Box No. II APPLICANT

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this box is the applicant's State (i.e. country) of residence if no State of residence is indicated below.)

SMITH, Jerry R.
5690 W. Rowland Avenue
Littleton, Colorado 80123
United States of America

☒ This person is also inventor.

Telephone No.

(303) 797-3029

Facsimile No.

(303) 794-4906

Teleprinter No.

State (i.e. country) of nationality:
United States of AmericanState (i.e. country) of residence:
United States of AmericaThis person is applicant
for the purposes of:all designated
Statesall designated States except
the United States of Americathe United States
of America onlythe States indicated in
the Supplemental Box

Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this box is the applicant's State (i.e. country) of residence if no State of residence is indicated below.)

This person is:



applicant only



applicant and inventor

inventor only (If this check-box
is marked, do not fill in below.)

State (i.e. country) of nationality:

State (i.e. country) of residence:

This person is applicant
for the purposes of:all designated
Statesall designated States except
the United States of Americathe United States
of America onlythe States indicated in
the Supplemental Box☐ Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf
of the applicant(s) before the competent International Authorities as:

agent



common representative

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

MARTIN, Timothy J.
HENSON, Michael R.
TIMOTHY J. MARTIN, P.C.
9250 W. 5th Avenue, Suite 200
Lakewood, Colorado 80226
United States of America

Telephone No.

(303) 232-3388

Facsimile No.

(303) 232-3288

Teleprinter No.

☐ Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

Box No.V DESIGNATION STATES

The following designations are hereby made under Rule 4.9(a) (mark the applicable check-boxes; at least one must be marked):

Regional Patent

- ☐ AP ARIPO Patent: KE Kenya, LS Lesotho, MW Malawi, SD Sudan, SZ Swaziland, UG Uganda, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- ☐ EA Eurasian Patent: AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☒ EP European Patent: AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☐ OA OAPI Patent: BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment desired, specify on dotted line)

National Patent (if other kind of protection or treatment desired, specify on dotted line):

- | | |
|---|---|
| <input type="checkbox"/> AL Albania | <input type="checkbox"/> LU Luxembourg |
| <input type="checkbox"/> AM Armenia | <input type="checkbox"/> LV Latvia |
| <input type="checkbox"/> AT Austria | <input type="checkbox"/> MD Republic of Moldova |
| <input checked="" type="checkbox"/> AU Australia | <input type="checkbox"/> MG Madagascar |
| <input type="checkbox"/> AZ Azerbaijan | <input type="checkbox"/> MK The former Yugoslav Republic of Macedonia |
| <input type="checkbox"/> BA Bosnia and Herzegovina | |
| <input type="checkbox"/> BB Barbados | <input type="checkbox"/> MN Mongolia |
| <input type="checkbox"/> BG Bulgaria | <input type="checkbox"/> MW Malawi |
| <input checked="" type="checkbox"/> BR Brazil | <input checked="" type="checkbox"/> MX Mexico |
| <input type="checkbox"/> BY Belarus | <input type="checkbox"/> NO Norway |
| <input checked="" type="checkbox"/> CA Canada | <input type="checkbox"/> NZ New Zealand |
| <input type="checkbox"/> CH and LI Switzerland and Liechtenstein | <input type="checkbox"/> PL Poland |
| <input type="checkbox"/> CN China | <input type="checkbox"/> PT Portugal |
| <input type="checkbox"/> CU Cuba | <input type="checkbox"/> RO Romania |
| <input type="checkbox"/> CZ Czech Republic | <input type="checkbox"/> RU Russian Federation |
| <input type="checkbox"/> DE Germany | <input type="checkbox"/> SD Sudan |
| <input type="checkbox"/> DK Denmark | <input type="checkbox"/> SE Sweden |
| <input type="checkbox"/> EE Estonia | <input type="checkbox"/> SG Singapore |
| <input type="checkbox"/> ES Spain | <input type="checkbox"/> SI Slovenia |
| <input type="checkbox"/> FI Finland | <input type="checkbox"/> SK Slovakia |
| <input type="checkbox"/> GB United Kingdom | <input type="checkbox"/> TJ Tajikistan |
| <input type="checkbox"/> GE Georgia | <input type="checkbox"/> TM Turkmenistan |
| <input type="checkbox"/> HU Hungary | <input type="checkbox"/> TR Turkey |
| <input type="checkbox"/> IL Israel | <input type="checkbox"/> TT Trinidad and Tobago |
| <input type="checkbox"/> IS Iceland | <input type="checkbox"/> UA Ukraine |
| <input checked="" type="checkbox"/> JP Japan | <input type="checkbox"/> UG Uganda |
| <input type="checkbox"/> KE Kenya | <input checked="" type="checkbox"/> US United States of America |
| <input type="checkbox"/> KG Kyrgyzstan | |
| <input type="checkbox"/> KP Democratic People's Republic of Korea | <input type="checkbox"/> UZ Uzbekistan |
| | <input type="checkbox"/> VN Viet Nam |
| <input type="checkbox"/> KR Republic of Korea | |
| <input type="checkbox"/> KZ Kazakhstan | |
| <input type="checkbox"/> LC Saint Lucia | |
| <input type="checkbox"/> LK Sri Lanka | |
| <input type="checkbox"/> LR Liberia | |
| <input type="checkbox"/> LS Lesotho | |
| <input type="checkbox"/> LT Lithuania | |

Check-boxes reserved for designating States (for the purposes of a national patent) which have become party to the PCT after issuance of this sheet:

- ☐ GH Ghana
- ☐ YU Yugoslavia
- ☐ ZW Zimbabwe (AP)
- ☐ SL Sierra Leone

In addition to the designations made above, the applicant also makes under Rule 4.9(b) all designations which would be permitted under the PCT except the designation(s) of _____

The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation of a designation consists of the filing of a notice specifying that designation and the payment of the designation and confirmation fees. Confirmation must reach the receiving Office within the 15-month time limit)

Box No. VI **PRIORITY CLAIM** Further priority claims are indicated in the Supplemental Box ☐

The priority of the following earlier application(s) is hereby claimed:

Country (in which, or for which, the application was filed)	Filing Date (day/month/year)	Application No.	Office of filing (only for regional or international application)
item (1) United States of America	09 July 96 (09.07.96)	60/021,435	
item (2)			
item (3)			

Mark the following check-box if the certified copy of the earlier application is to be issued by the Office which for the purposes of the present international application is the receiving Office (a fee may be required):

☒ The receiving Office is hereby requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) identified above as item(s): (1)

Box No. VII **INTERNATIONAL SEARCHING AUTHORITY**

Choice of International Searching Authority (ISA) (If two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used): ISA / US

Earlier search Fill in where a search (international, international-type or other) by the International Searching Authority has already been carried out or requested and the Authority is now requested to base the international search, to the extent possible, on the results of that earlier search. Identify such search or request either by reference to the relevant application (or the translation thereof) or by reference to the search request:

Country (or regional Office): Date (day/month/year): Number:

Box No. VIII **CHECK LIST**

This international application contains the following number of sheets:

- 1. request : 3 sheets
- 2. description : 15 sheets
- 3. claims : 4 sheets
- 4. abstract : 1 sheets
- 5. drawings : 5 sheets

Total : 28 sheets

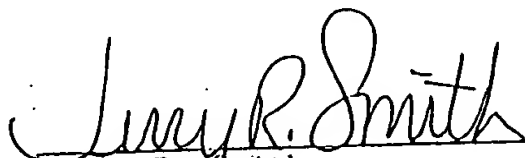
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Figure No. _____ of the drawings (if any) should accompany the abstract when it is published.

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1. TRANSMITTAL FEE 230.00 T

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13-1940

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(day/month/year)Signature Timothy J. Martin

ELECTROMECHANICAL SWITCHING DEVICE

RELATED APPLICATION

This application claims the benefit of U.S. Provisional Application No. 60/021,435, filed July 9, 1996.

FIELD OF INVENTION

The present invention is directed to electromechanical switches for automatically providing a desired polarity connection between two sources of power. Though not by way of limitation, the present invention finds particular application in the automotive field in order to properly interconnect like terminals of a pair of vehicle batteries for recharging.

BACKGROUND OF THE INVENTION

Relays and switches are used in a variety of industrial and commercial applications where there is a need to control power. A relay may be either an electromechanical or solid-state device to control other devices connected to an output. Relays are generally associated with controlling the transmission of electric current in a circuit.

Electromechanical relays are used as switches that make or break a circuit by mechanical operation. Here, an electromagnet moves an armature when current flows through the electromagnet, and the armature acts as a switch. Where the magnetic field produced by a current-carrying coil is used to magnetize and move a plunger, the electromagnet may also be referred to as a solenoid.

It is known to employ either electromechanical or solid-state switches in order to ensure proper polarity connection between two sources of power. One exemplary application for such use is in the automotive field for the purpose of interconnecting rechargeable batteries. It is not uncommon for vehicles having rechargeable batteries, such as automobiles, busses, trucks, etc. and even watercraft to require boosts on their batteries from external sources of DC power. For example, in emergency situations, it may be necessary to jump-start a vehicle by connecting one vehicle's "dead" battery to another vehicle's "live" battery. Jumper

cables can be used for this purpose, but it is imperative to connect the batteries with proper polarity, i.e. positive to positive and negative to negative. Failure to do so can potentially cause serious damage to either or both vehicles' electrical systems.

In the past, a variety of techniques have been employed by others to ensure proper interconnection between vehicle batteries. For example, U.S. Patent No. 4,400,658 to Yates, issued August 23, 1983, relates to a battery cable jumper arrangement incorporating a plurality of solenoids and a switching arrangement. A pair of double pole, double throw (DPDT) switches are actuated by the solenoids to ensure correct polarity of connection between the power source and the battery, irrespective of the connected arrangement of the cable pairs. In U.S. Patent No. 5,103,155 to Joannou, issued April 7, 1992, a battery charging system utilizes solid-state components interconnected between two pairs of booster cables. Joannou's device incorporates an electronic polarity sensing, monitoring and alarm circuit and a polarity sensing relay.

SUMMARY OF INVENTION

It is an object of the present invention to provide a new and useful electromechanical switching device which is adapted for interconnection between a pair of power sources and operative to establish electrical communication between desired terminals of the power sources, such as between like terminals.

It is another object of the present invention to provide an electromechanical switching device which utilizes either electromagnetic or solenoid technology to ensure proper interconnection between two power sources.

A further object of the present invention is to provide a new and useful electromechanical switching device which is relatively easy and inexpensive to manufacture.

Yet another object of the present invention is to provide a new and useful methodology for ensuring automatic, desired electrical interconnection between two sources of power.

The present invention is particularly adapted to interconnect like terminals of a pair of power sources. To this end, the invention broadly includes a plurality of current-carrying coils each adapted to electrically connect in a selected connection state to the oppositely polarized terminals associated with the respective one of the power sources to produce an associated magnetic field so that a composite magnetic field is established for the plurality of coils. A switch is then magnetically coupled to the coils and is operative when the coils are connected to the power sources to interact with the composite magnetic field thereby to interconnect the like terminals of the power sources irrespective of the connection states of the coils.

In its basic forms, the invention provides an electromechanical switch device that is operative to electrically interconnect the positive terminal of the first power source to a selected one of the positive and negative terminals of the second power source and a negative terminal of the first power source to the other one of the positive and negative terminals of the second power source thereby to define a selected coupled state. This switching device includes a switch that has first, second and third pairs of contacts with the switch being movable between a first state wherein each of the third pair of contacts is placed in electrical communication with respect to one of the second pair of contacts and a second state wherein each of the third pair of contacts is placed in electrical communication with respect to one of the second pair of contacts.

A first pair of electrical leads have first ends connected to the first pair of contacts and also to the second pair of contacts in a configuration such that the electrical communication between the third electrical contacts and the first pair of the leads is reversed when the switch moves from the first state to the second state. A second pair of electrical leads have first ends connected to the third contacts. Second ends of both the first and second ends of

electrical leads are then adapted to connect respectively to the positive and negative terminals of the first and second power sources.

A switch controller is provided which includes a plurality of current-carrying coils which are in electrical communication with the first and second pairs of electrical leads and an actuator coupled to set switch. The current-carrying coils, when connected to the power sources produce a composite magnetic field with the coils being arranged such that the actuator interacts with the composite magnetic field to automatically move the switch into whichever one of the first and second states results in the interconnection of the first and second power sources in the selected couple state regardless of the respective connections in the second ends of the leads to the power sources.

Preferably, the switch is a double pole double throw switch, and the switch controller includes an inner coil interposed between a pair of outer coils. The inner and outer coils are movable with respect to one another as a result of the magnetic interaction when current flows through the coils. The actuator is then secured to one of the inner and outer coils for common movement therewith thereby to throw the switch. Preferably, the inner and outer coils are spiral wound and axially aligned so that the actuator may move in an axial direction internally of the coils. The actuator is preferably secured to the inner coil while the outer coils are fixed so that reciprocation of the inner coil reciprocates the actuator between first and second positions. The first and second coils are then wound in opposite directions relative to the common coil axis and are electrically interconnected so that, when current is passed therethrough, the first and second coils produce magnetic fields having a common polarity opposed to one another. The outer coils are, for convenience, are wound with a common piece of wire.

Accordingly, the present invention is also directed to a method of ensure proper electrical interconnection between a

pair of power sources. The method includes these steps of producing a first magnetic field associated with a first one of the power sources, and producing a pair of second magnetic fields associate with a second one of the power sources. A switch is then actuated in response to interaction between the first and second magnetic fields thereby to establish electrical interconnection between like terminals of the power sources. This method accomplishes the step of producing the magnetic fields by interconnecting a first power source to a first current-carrying coil and the step of producing the second magnetic field is accomplished by connecting the second power source to a pair of second current-carrying coils in a manner such that the second magnetic fields are oriented oppositely with respect to one another.

These and other objects of the present invention will become more readily appreciated and understood from a consideration of the following detailed description of the exemplary embodiments of the present invention when taken together with the accompanying drawings, in which:

BRIEF DESCRIPTION OF DRAWINGS

Figure 1 is a perspective view of a charging system according to the present invention;

Figure 2 is a diagrammatic view of the charging system shown in Figure 1;

Figure 3 is a circuit diagram showing the principal features of the charging system, and its associated electromechanical switching device, according to a first exemplary embodiment of the present invention;

Figures 4(a) through 4(e) are diagrammatic views illustrating the operation of the electromechanical switching device of Figure 3 in response to various connected states of the two power sources;

Figure 5 is a diagrammatic view illustrating the operation of an electromechanical switching device according to a second embodiment of the present invention;

Figure 6 is a circuit diagram showing the principal features of the charging system, and its associated electromechanical switching device, according to a third exemplary embodiment of the present invention;

Figure 7 is a side view in elevation of the solenoid component for the electromechanical switching device depicted in Figure 6; and

Figure 8 is a cross-sectional view of the solenoid as viewed about lines 8 - 8 in Figure 7.

DETAILED DESCRIPTION OF THE EXEMPLARY EMBODIMENTS

The present invention is directed to an electromechanical switching device that automatically provides desired polarity connection between two sources of power. For example, in the vehicle industry, which includes automobiles, buses, etc. and in the watercraft industry, rechargeable batteries are used to start the vehicle's or boat's engine. Sometimes, it is necessary to utilize the battery of one vehicle or craft to boost-start the engine of another. The present invention provides a means for automatically assuring that correct polarity connections between the electrical systems of two vehicles or water crafts are made. Thus, the present invention is described with this application in mind; however, it should be understood that other applications requiring desired polarity interconnection could employ the technique described herein.

With that in mind, a first exemplary embodiment of the present invention is shown in Figure 1 wherein electromechanical switching device 10 is shown interconnecting two sources of power in the form of a first battery 12 and a second battery 14. Switching device 10 includes a housing 20 and first and second electrical cables 22 and 28. Each of cables 22 and 28 are formed by a pair of electrical leads. Thus, it may be seen that first cable 22 includes a lead 23 that terminates in an alligator clamp 24 that is connected to the positive terminal 15 of first battery 12. Lead 25 of first cable 22 also terminates in an alligator connector 26

that is connected to negative terminal 16 of first battery 12. Second cable 28 likewise has a pair of leads 29 and 31. Lead 29 terminates in an alligator connector 30 that is connected to the positive terminal 17 of second battery 14. Similarly, lead 31 terminates in an alligator clamp 32 that is releasably connected to negative terminal 18 of second battery 14. Housing 20 contains electromechanical switching circuitry that ensures proper interconnection of the two power sources and, to this end, electrical leads 23, 25, 29 and 31 are electrically connected to this circuitry at ends opposite the respective alligator clamps. With reference to Figure 2, it may be seen that housing 20 includes a switch 34 and a switch control device 36 which determines the condition of switch 34. Switch 34 is preferably a double-pole double-throw (DPDT) switch which has its center contacts 38 and 40 connected to the positive and negative terminals of Power Source "A" (in the form of battery 12). A first set of throw contacts 42 and 44 of switch 34 are connected respectively to the positive and negative terminals of Power Source "B" (in the form of battery 12) while a second set of throw contacts 46 and 48 are cross-connected to first ends of leads 29 and 31. This reverses the electrical communication between the third contacts and the electrical leads 29 and 31 which the switch is moved between switching states. Switch control device 36 is provided to control which pair of throw contacts 42, 44 or 46, 48 are placed respectively in contact with the third set of contacts, designated as center contacts 38 and 40 to define a first and second state for switch 34. That is, a switch control device 36 determines movement or the "throw" of switch 34 and accomplishes it in a manner that automatically puts the desired polarity in a connection between the two power sources. This condition may be referred to as the "coupled state" for the two power sources.

Where electromechanical device 10 is employed as a jumper cable for vehicle or watercraft use, it is desired that the two power sources, such as batteries 12 and 14 be

interconnected so that like polarities are in electrical communication to one another. Accordingly, for sake of explanation, a first exemplary embodiment of the present invention is shown in Figure 3 for connection to two power sources in the form of batteries 12 and 14 so that like polarities are interconnected as the coupled state. In Figure 3, it may be seen that switch control device 36 is in the form of a plurality of current carrying coils which each produce associated magnetic fields so that the array of coils establishes a composite magnetic field that controls a position of an actuator for switch 34.

In the first exemplary embodiment, a center coil 50 is wound counterclockwise and is in electrical communication with leads 23 and 25 respectively by way of leads 53 and 55. Center coil 50 is interposed in spaced relation between a pair of outer coils 60 and 62 with first outer coil 60 being wound counterclockwise and second outer coil 62 being wound clockwise. Coils 60 and 62 are electrically interconnected to one another by electrical lead 64 and may preferably be wound from a common strand of wire. Coils 60 and 62 are in turn interconnected to leads 29 and 31, respectively, by leads 63 and 65. As noted above, leads 23 and 25 have first ends that are connected, respectively, to contacts 38 and 40 of switch 34. Lead 63 is connected to contacts 42 and 48 of switch 34, and lead 65 is connected to contacts 44 and 46 of switch 34.

Preferably, coils 50, 60 and 62 are formed by spools which have hollow cores and about which a spiral winding of wire is supported. For example, center or inner coil 50 includes a spool 52 having a longitudinally extending central bore 54 therethrough. Outer coil 60 includes a spool 66 having a longitudinally extending bore 67 extending therethrough while coil 62 includes a spool 68 having a longitudinally extending bore 69 extending therethrough. Coils 50, 60 and 62 are preferably longitudinally aligned with one another along a common coil axis "X" so that bores 54, 67 and 69 are aligned with one another.

Switch 34 includes an actuator 70 that extends through bores 54, 67 and 69. In the first exemplary embodiment, actuator 70 is secured to spool 52 so that movement of coil 50 to the left or right as shown in Figure 3 causes actuator 70 to move to the left or right respectively. Coils 60 and 62 are fixed with respect to the housing 20, in any convenient manner, and actuator 70 is spring biased by means of centering springs 72 and 74 acting, for example, against sidewall 21 of housing 20 so as to maintain actuator 70 in a neutral position wherein there is no electrical communication between contacts 38, 40 and any of contacts 42, 44, 46 and 48. Electrical communication only occurs when a connection is made to the power sources.

This neutral position is diagramed in Figure 4(a). Here, it may be seen that center coil 50 is equidistantly positioned between outer coils 60 and 62 such that actuator 70 is in a neutral position. When actuator 70 is in the neutral position, it may be seen that the poles associated with pole contacts 38 and 40 do not make electrical communication with any of contacts 42, 44, 46 or 48. Electromechanical switch device 10 is thus in a neutral state prior to interconnection with a power source.

However, with reference to Figures 4(b)-4(e), it may be seen that, when electromechanical switching device 10 is connected between two power sources, it automatically operates to establish electrical communication between like terminals of the power sources. Thus, for example, in Figure 4(a), the connection of leads 23 and 25 to the positive and negative terminals of a power source creates a circuit through center coil 50 so that it has a north and south magnetic poles, with these poles being respectively designated as "N" and "S". Correspondingly, contact 40 is negatively biased while contact 42 is positively biased. When leads 29 and 31 are respectively connected to the positive and negative terminals of a second power source an electrical circuit is established between outer coils 60 and 62 which generate associated

magnetic poles. Here, due to their opposite winding, coils 60 and 62 have south poles opposed to or facing one another and north poles outwardly opposite one another. As a result, coil 50 is repelled from coil 60 and attracted to coil 62. Coil 50 thus moves to the right as is shown in Figure 4(b), and actuator 70 toggles switch 34 so that contact 40 is placed in electrical communication with contacts 44 and 46 while contact 38 is placed in electrical communication with contact 42. Thus, the positive terminals of the two power sources are in electrical communication with one another and the negative terminals of the two power sources are in electrical communication with one another. Correspondingly, contact 42 is positive while contacts 44, 46 are negatively biased.

If the connection to each of the power sources is reversed, as is shown in Figure 4(c), a similar circuit configuration results. Here, leads 23 and 25 are respectively connected to the negative and positive terminals of the first power source while leads 29 and 31 are respectively connected to the negative and positive terminals of the second power source. This reverses the magnetic poles for each of coils 50, 60 and 62. However, due to this reversal, coil 50 still shifts to the right by being attracted to coil 62 and being repelled from coil 60. Actuator 70 again moves to the right placing electrical contact 38 in communication with electrical contact 42 and electrical contact 40 in communication with contacts 44 and 46. However, since the electrical bias of each of the contacts is reversed, once again the positive terminals of the two power sources are in communication as are the negative terminals.

With reference to Figure 4(d), the electrical connection to the first power source by leads 23 and 25 are the same as that shown in Figure 4(b). Here, however, the electrical connection of leads 29 and 31 are reversed so that lead 29 is connected to the negative terminal of the second power source and lead 31 is connected to the positive terminal. When so connected, coil 50 has its magnetic polarity the same as that

shown in Figure 4(d). However, each of coils 60 and 62 are reversed so that now the north poles face one another with the south poles opposite one another. Accordingly, coil 50 will be attracted to coil 60 and repelled by coil 62. Coil 50 and actuator 70 thus move to the left as is shown in Figure 4(d). This places electrical contact 38 in communication with contacts 44, 46 and electrical contact 40 in communication with electrical contact 48. Since electrical contacts 44 and 46 are positively biased, and since electrical contact 48 is negatively biased, with respect to the second power source, the positive polarities of each of the power sources are again in communication as are the negative terminals.

Finally, in Figure 4(e), the electrical connection of leads 29 and 31 to the second power source are the same as shown in Figure 4(b). Here, however, the electrical connection of leads 23 and 25 are reversed with respect to the first power source with lead 23 being connected to the negative terminal and lead 25 being connected to the positive terminal. Accordingly, in comparison with Figure 4(b), the magnetic polarity of coil 60 and 62 remains the same while the magnetic polarity of coil 50 is reversed. In this configuration, coil 50 is attracted to coil 60 and repelled by coil 62, thus causing it and actuator 70 to move to the left. Again, contact 38 is placed in electrical communication with contacts 44, 46 while contact 40 is electrically in communication with contact 48. Since leads 23 and 25 are reversed, however, contact 38 is negatively biased and contact 40 is positively biased with respect to the second power source. Accordingly, matching polarity is again achieved.

While the present invention has been described with respect to an electromechanical switching device that is operative to automatically ensure that like terminals of two power sources are placed in communication, such as would be desirable for an automobile "jumper cable", the ordinarily skilled person in this field would recognize that the exemplary embodiments shown in Figures 1-4 could be modified

to ensure that opposite polarity terminals of two power sources are automatically placed in communication. Thus, with reference to Figure 5, it may be seen that merely the reversing of the winding of coil 50 is all that is required to accomplish this task. Figure 5 may readily be compared to Figure 4(b) to determine that an opposite result occurs by this reverse winding of coil 50. Here, when leads 23 and 25 are respectively connected to the positive and negative terminals of a first power source, the magnetic polarity of coil 50 is reversed so that its north pole is located on the left side and the south pole is located on the right side. When leads 29 and 31 are connected, a polarity of coil 60 and 62 are the same as that shown in Figure 4(b). As a result of reversing the polarity of coil 50, though, coil 50 is attracted to coil 60 and repelled by coil 62. Thus, coil 50 and actuator 70 move to the left. This toggles switch 34 so that contact 38 is placed in electrical communication with contacts 44 and 46 while contact 40 is placed in communication with contact 48. Thus, in a positive terminal of the first power source is connected to the negative terminal of the second power source and the negative terminal of the first power source is connected to the positive terminal of the second power source. A similar result of connecting opposite polarities would occur for the other possible connection states, as well.

Moreover, it should be appreciated that, in the embodiment shown in Figures 1-5, coils 60 and 62 are held stationary, while coil 50 and actuator 70 translate between coils 60 and 62. It should be understood, though, that coil 50 could be stationary and the structure provided so that coils 60 and 62 translate along with the actuator 70. Also, as described below, it is possible that all three coils 50, 60 and 62 be held stationary while translating only the actuator 70.

A third alternate embodiment of the present invention is shown in Figures 6-8 where an electromechanical switching

device 110 employs a solenoid 135 as switch control device 136. Here again, electromechanical switching device 110 includes a pair of leads 123, 125 which are adapted to interconnect to a first power source such as battery 112. A second pair of leads 129 and 131 are likewise provided to connect to a second power source such as battery 114. Leads 123, 125 connect to a central winding 150 of solenoid 135 by means of leads 153 and 155. Leads 123 and 125 are also connected to contacts 138 and 140 respectively of switch 134. Lead 129 is connected by lead 163 to a first outer winding 160 of solenoid 135, and outer winding 160 is connected to a second outer winding 162 of solenoid 135 by means of a lead 164. Electrical connection is then made by lead 131 to coil 162 by way of lead 165. Lead 129 also establishes electrical communication to contacts 142 and 148 of switch 134 while lead 131 is in electrical communication with contacts 144 and 146 of switch 134. Centering springs 172 and 174 maintain actuator 170 in a neutral position, for example, against sidewall 121 of the housing for electromechanical switch 110.

Thus, it should be appreciated that the structure of the third exemplary embodiment shown in Figure 6 is identical with respect to the embodiment shown in Figures 1-4 except that a single solenoid 135 having multiple windings replaces coils 50, 60 and 62. Here, also, it should be appreciated that actuator 170 includes as a portion thereof a magnetic permeable material such that actuator 170 translates axially within solenoid 135. Thus, solenoid 135 remains stationary within the housing while actuator 170 interacts with switch 134 to change to the electrical state thereof.

The structure of solenoid 135 may best be seen in reference to Figures 7 and 8. Solenoid 135 is preferably about 2.5-3.0 inches (6.3-7.6 cm) long and 1.0-1.25 inches (2.5-3.2 cm) in diameter. Here, it may be seen that coil 150 is wound on an insulated spool 178 while coils 160 and 162 are respectively wound on insulating spools 180 and 182. Spools 178, 180 and 182 are preferably formed of an insulating

material, such as plastic. Spool 178 is separated from each of spools 180 and 182 by means of a spacer or washer 184 preferably formed of a magnetic permeable material such as soft iron. A pair of end caps 186 and 188 enclose opposite ends of solenoid 135 with the end caps formed of a magnetic permeable material, again such as soft iron. With this construction, end caps 186 and 188 get polarized, respectively, by coils 160 and 162. End caps 186 and 188 have inwardly facing conic surfaces 187 and 189.

Actuator 170 includes an elongated rod 172 which extends axially through solenoid 135 and is in the form of a cylindrical rod made from metallic material, such as stainless steel. A core 190 is positioned centrally in cavity 192 formed between end caps 186, 188 and spools 178, 180 and 182. Core 190 is formed of a magnetic permeable material, such as soft iron that reacts to the magnetic fields generated by solenoid 135, and has opposite frustoconical ends 197 and 199 configured similarly to surfaces 187 and 189. Rod 172 is secured to core 190 by means of suitable clips 194 so that rod 172 and core 190 translate together as a single unit.

From this description, it should be appreciated that coils 150, 160 and 162 perform a similar function as coils 50, 60 and 62. Here, however, the shifting of actuator 170 to the left or right occurs as a result of the interaction of the magnetic permeability of core 190. Actuator 170 thus actuates switch 134 similarly to that described with respect to switch 34.

From the foregoing, it should be appreciated that the present invention also includes a method having shown desired electrical interconnection automatically between a pair of power sources where each of the power sources includes a positive terminal and a negative terminal. This method is accomplished by the structure described above, but broadly includes the first step of producing a first magnetic field associated with a first one of the power sources and producing a pair of second magnetic fields associated with a second one

of the power sources. Finally, the broad method includes actuating a switch in response interaction between the first magnetic field and the second magnet fields thereby to establish electrical interconnection between the desired terminals of the power sources.

This method preferably includes the step of actuating the switch so as to establish electrical interconnection between the like terminals of the power sources. The step of producing the first and second magnetic fields is accomplished by electrically interconnecting the positive terminal and negative terminal associated with a first one of the power sources to a first current-carrying coil and electrical interconnecting the oppositely polarized terminals associated with a separate one of the power sources to a pair second current-carrying coils in a manner such that the second magnetic fields are oriented oppositely with respect to one another. The method then includes interposing the first current-carrying coil between the second current-carrying coils in spaced relation and actuating the switch in response to relative movement between the first and second coils.

Accordingly, the present invention has been described with some degree of particularity directed to the exemplary embodiment of the present invention. It should be appreciated, though, that the present invention is defined by the following claims construed in light of the prior art so that modifications or changes may be made to the exemplary embodiments of the present invention without departing from the inventive concepts contained herein.

I claim:

1. An electromechanical switching device operative to electrically interconnect a positive terminal of a first power source to a selected one of a positive and negative terminal of a second power source and a negative terminal of said first power source to another one of the positive and negative terminals of said second power source thereby to define a selected coupled state for the first and second power sources, comprising:

(a) a switch including a first pair of contacts, a second pair of contacts and a third pair of contacts, said switch movable between a first state wherein each of said third pair of contacts is placed in electrical communication with a respective one of said second pair of contacts and a second state wherein each of said third pair of contacts is placed in electrical communication with a respective one of said second pair of contacts;

(b) a first pair of electrical leads having first ends each respectively connected to a selected one of said first pair of contacts and to a selected one of said second pair of contacts in a configuration such that electrical communication between each of said third electrical contacts and said first pair of electrical leads is reversed when said switch moves from said first state to said second state, said first pair of electrical leads having second ends adapted to connect respectively to the positive and negative terminals of one of said first and second power sources;

(c) a second pair of electrical leads having first ends each respectively connected to a selected one of said third contacts and second ends adapted to connect respectively to the positive and negative terminals of another of said first and second power sources; and

(d) a switch controller including a plurality of current-carrying coils in electrical communication with said first and second pairs of electrical leads and an actuator coupled to said switch, said current carrying coils operative

upon connection of the second ends of said first and second pairs of leads to said first and second power sources to produce a composite magnetic field, said coils arranged such that said actuator interacts with said composite magnetic field to automatically move said switch into whichever one of said first and second states that interconnects said first and second power sources in the selected coupled state regardless of the respective connections of the second ends of said first and second pairs of leads to the positive and negative terminals of said first and second power sources.

2. An electromechanical switching device according to claim 1 wherein said switch is a double pole double throw switch.

3. An electromechanical switching device according to claim 1 wherein said switch controller includes an inner coil interposed between a pair of outer coils, said inner and outer coils movable with respect to one another as a result of magnetic interaction therebetween when current flows therethrough, said actuator secured to one of the inner and outer coils for common movement therewith.

4. An electromechanical switching device according to claim 1 wherein said switch controller includes an inner coil interposed and movable between fixed first and second outer coils, said actuator secured to said inner coil for common movement therewith.

5. An electromechanical switching device according to claim 4 wherein said first and second coils are spiral wound in opposite directions with respect to a common coil axis and are electrically interconnected so that, when current is passed therethrough, said first and second coils respectively produce magnetic fields having a common polarity opposed to one another.

6. An electromechanical switching device adapted for use with a pair of power sources each including a positive terminal and a negative terminal, said electromechanical switching device operative to establish electrical

communication between like terminals of the power sources, comprising:

(a) a plurality of current-carrying coils each adapted to electrically connect in a selected connection state to the oppositely polarized terminals associated with a respective one of said power sources to produce an associated magnetic field so that a composite magnetic field is established; and

(b) a switch magnetically coupled to said coils and operative when said coils are connected to the power sources to interact with the composite magnetic field thereby to interconnect the like terminals of the power sources irrespective of the selected connection state of said coils.

7. An electromechanical switching device according to claim 6 wherein said switch includes an actuator and a plurality of switch contacts.

8. An electromechanical switching device according to claim 6 wherein said electromechanical switching device consists of three said coils.

9. An electromechanical switching device according to claim 8 wherein said coils are positioned about and are aligned along a longitudinally extending coil axis.

10. An electromechanical switching device according to claim 9 including a pair of longitudinally spaced apart outer coils and an inner coil interposed therebetween in spaced relation from each of said outer coils.

11. An electromechanical switching device according to claim 10 wherein each of said coils includes a spool and a spiral winding of wire supported thereon.

12. An electromechanical switching device according to claim 10 wherein said outer coils are wound in opposite directions.

13. An electromechanical switching device according to claim 10 wherein said outer coils are wound with a common piece of wire.

14. An electromechanical switching device according to claim 7 wherein said coils are aligned along a longitudinally

extending coil axis, said actuator extending through said coils along the coil axis and operative to move longitudinally therealong when said switch interacts with the composite magnetic field.

15. A method of ensuring desired electrical interconnection automatically between a pair of power sources, wherein each of said power sources includes a positive terminal and a negative terminal, comprising the steps of:

(a) producing a first magnetic field associated with a first one of said power sources;

(b) producing a pair of second magnetic fields associated with a second one of said power sources; and

(c) actuating a switch in response to interaction between said first magnetic field and second magnetic fields thereby to establish electrical interconnection between the desired terminals of said power sources.

16. The method according to claim 15 wherein the step of producing said first magnetic field is accomplished by electrically interconnecting the positive terminal and the negative terminal associated with a first one of said power sources to a first current-carrying coil, and wherein the step of producing said second magnetic fields is accomplished by electrically interconnecting the oppositely polarized terminals associated with a second one of said power sources to a pair of second current-carrying coils in a manner such that the second magnetic fields are oriented oppositely with respect to one another.

ABSTRACT

An electromechanical switching device ensures automatic selected polarity interconnection between terminals of two power sources. A double pole double throw (DPDT) switch has three pairs of contacts. A first pair of leads connect to two pairs of contacts in a manner that reverses polarity when switched, while a second pair of leads connect to the other pair of contacts. A switch controller employs a plurality of coils in electrical communication with the two pairs of leads. The coils are arranged and configured so that, when the two pairs of leads are connected to the respective power sources, the coils cause an actuator to move the switch automatically into the correct polarity state regardless of the connections of the leads. The invention is described as a battery jumper cable and to automatically connect like terminals of a pair of batteries. The invention encompasses the method of this device.

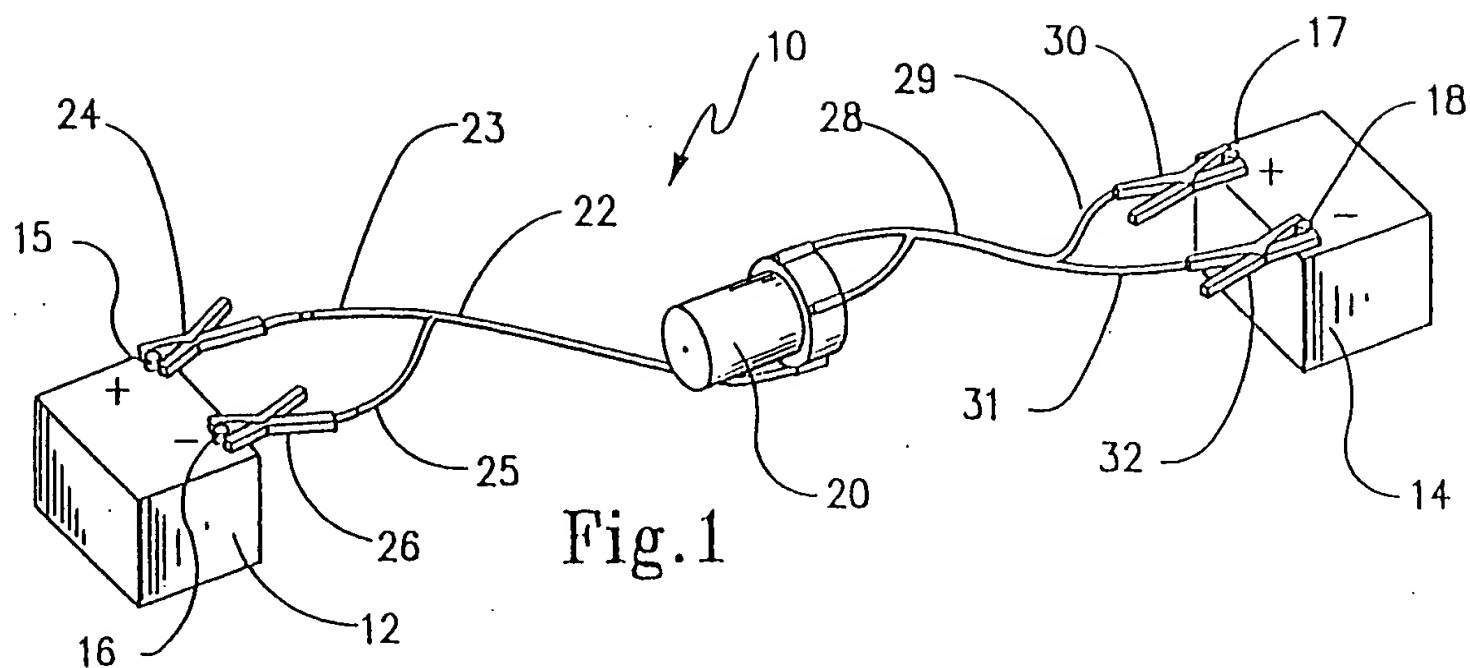


Fig. 1

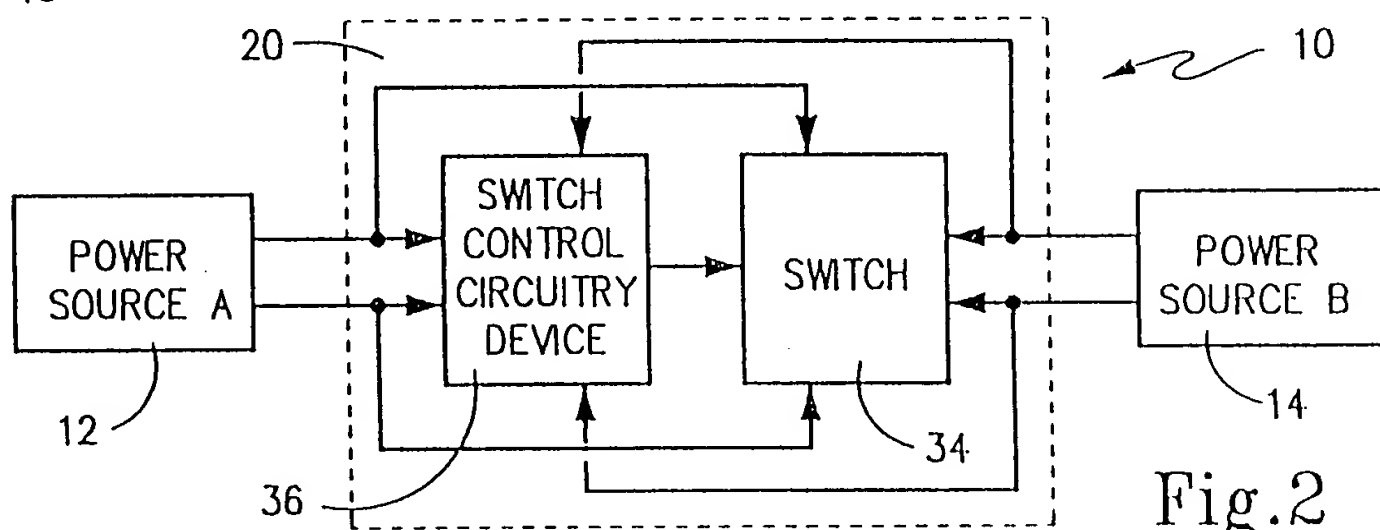


Fig. 2

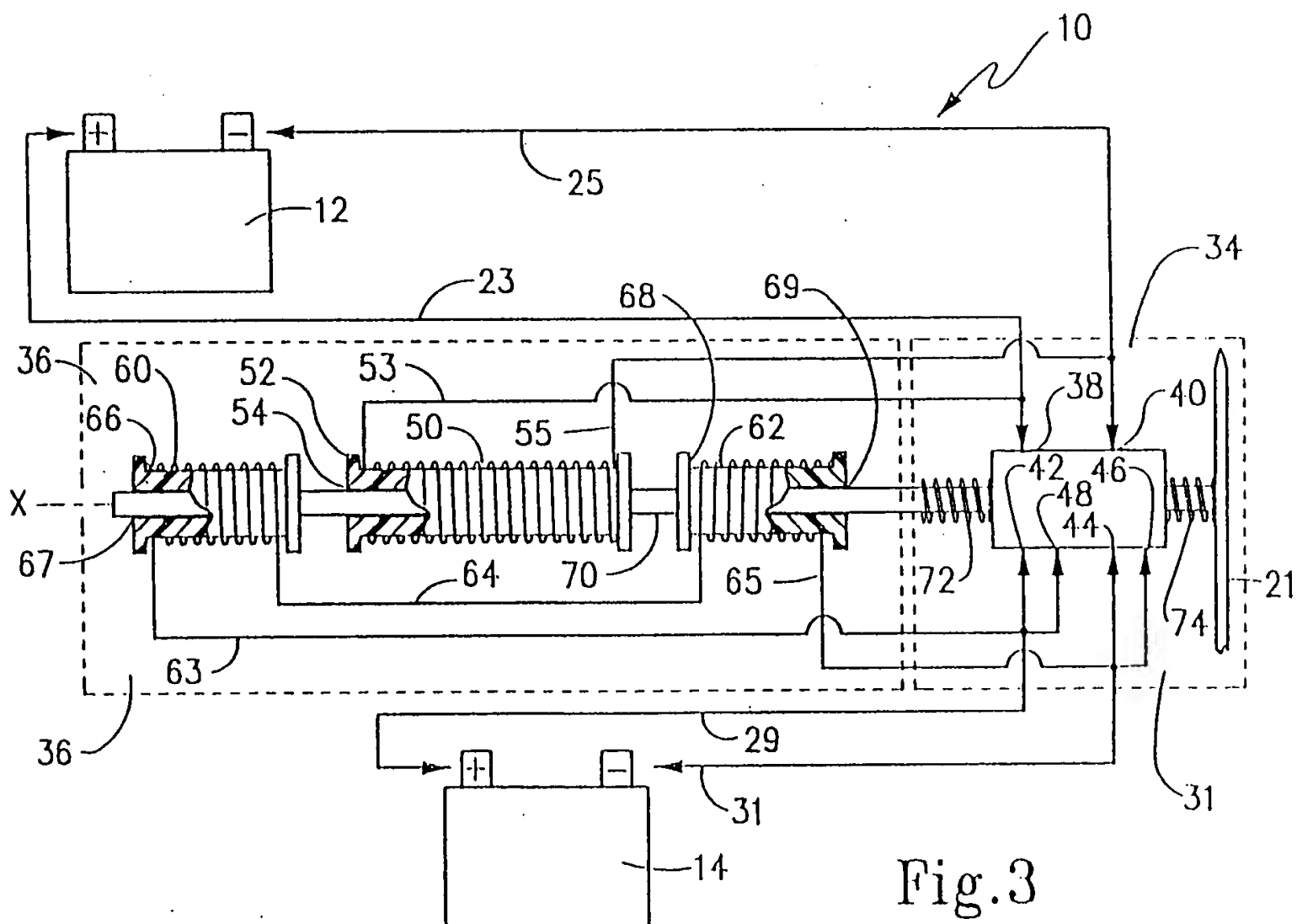


Fig. 3

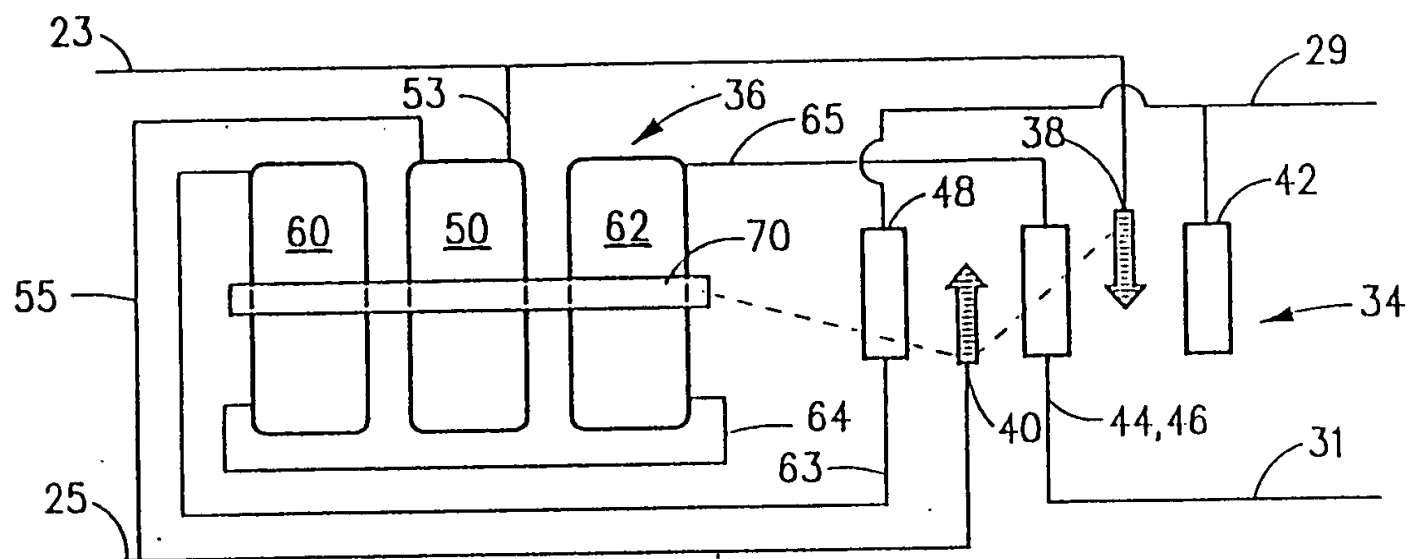


Fig. 4a

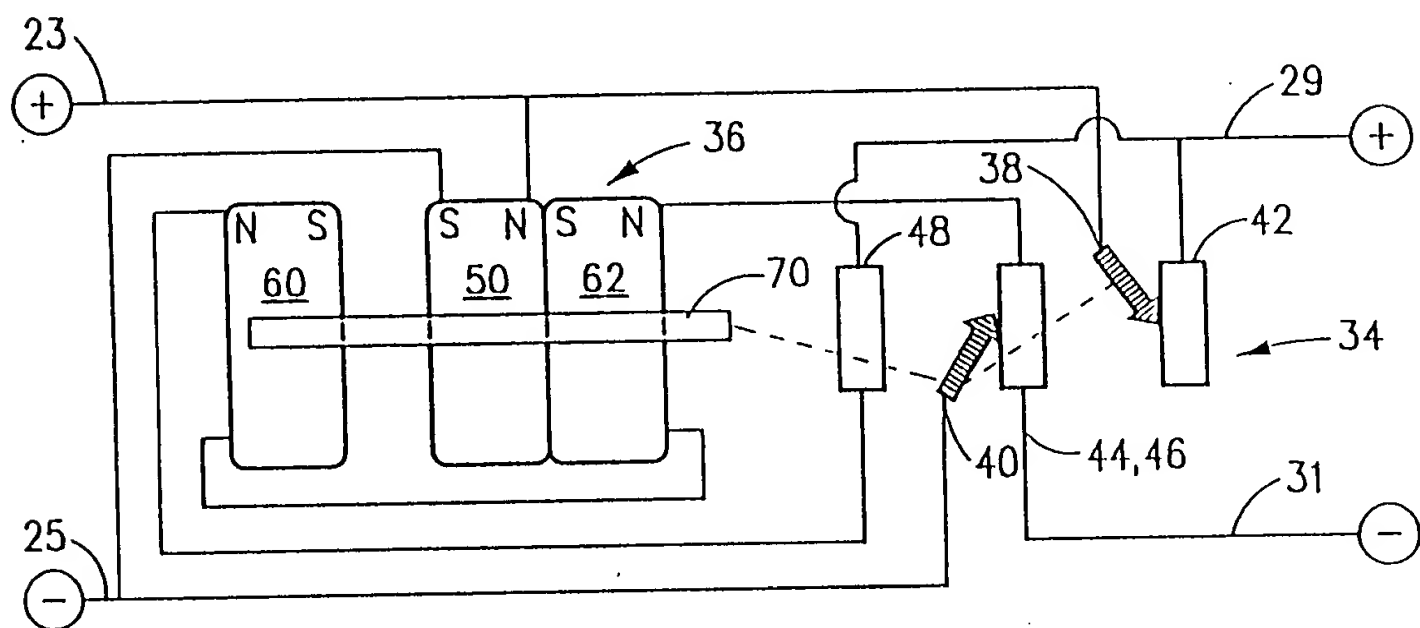


Fig. 4b

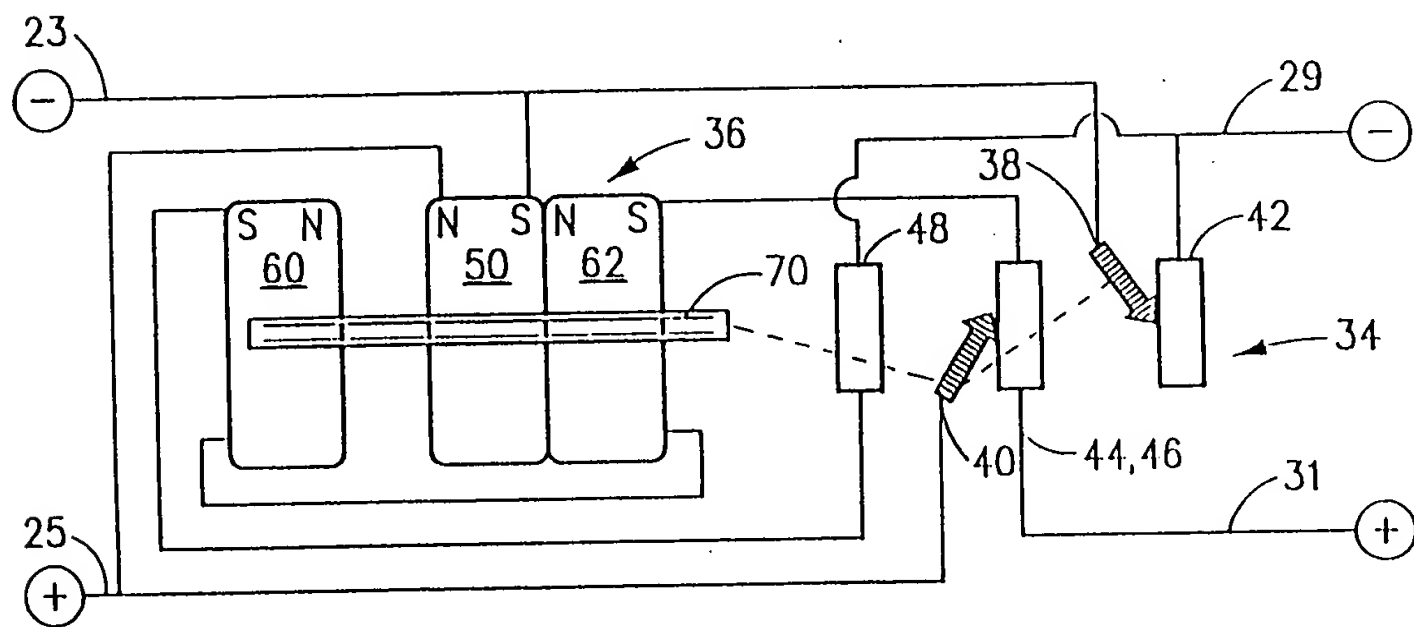


Fig. 4c

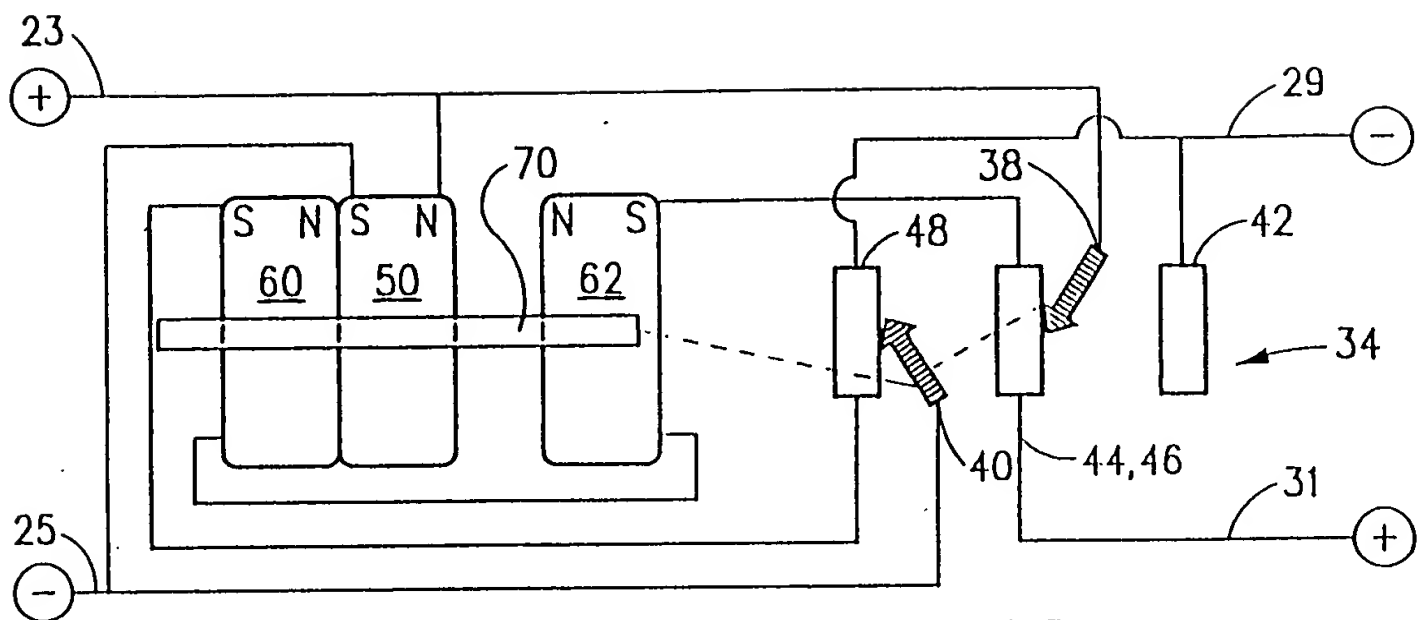


Fig.4d

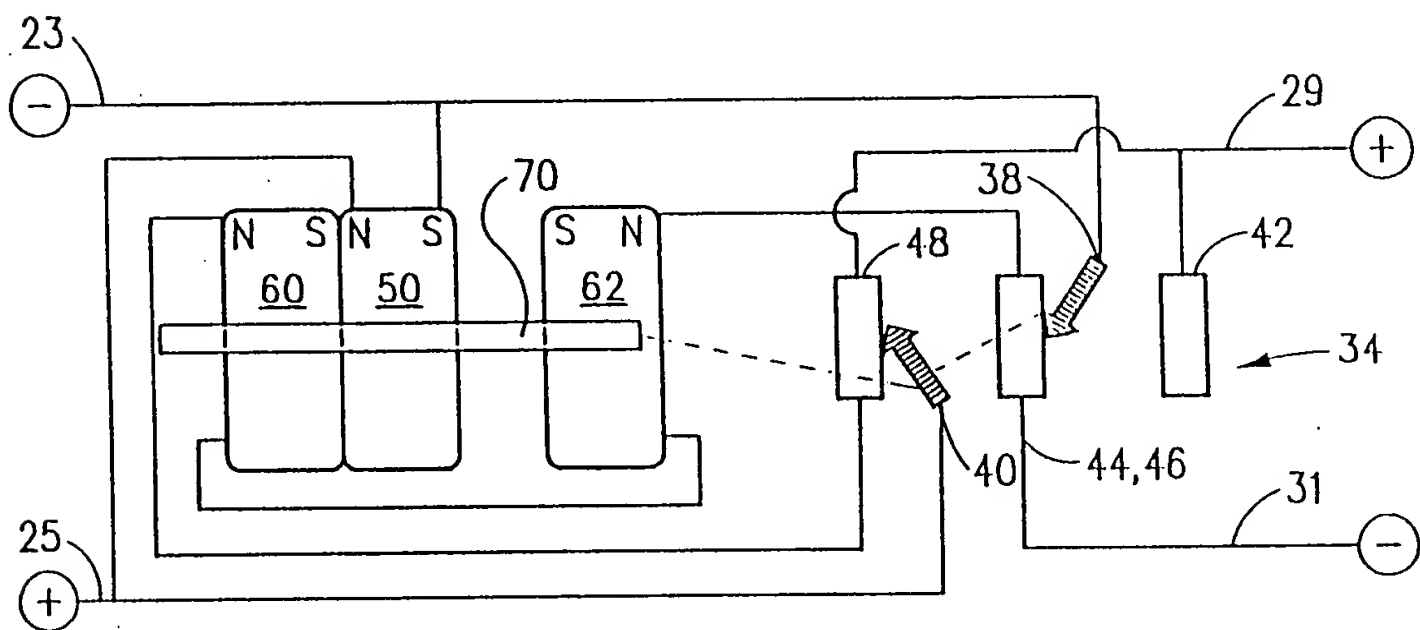


Fig.4e

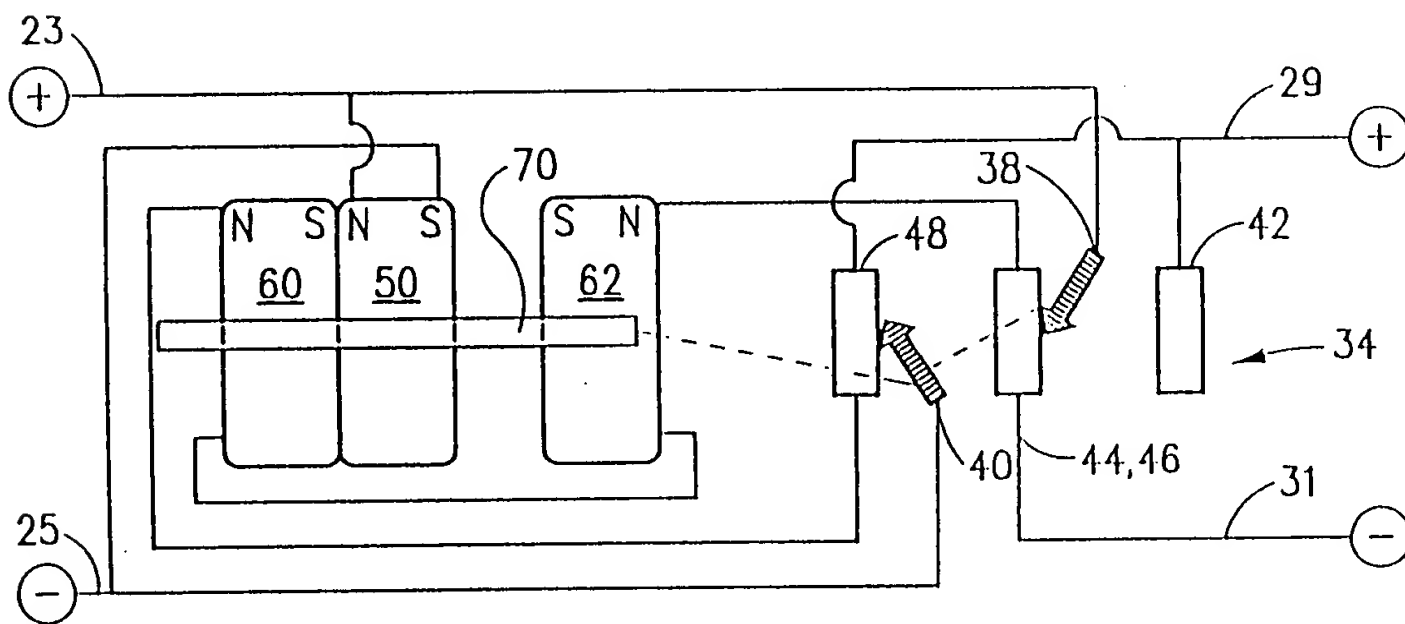


Fig.5

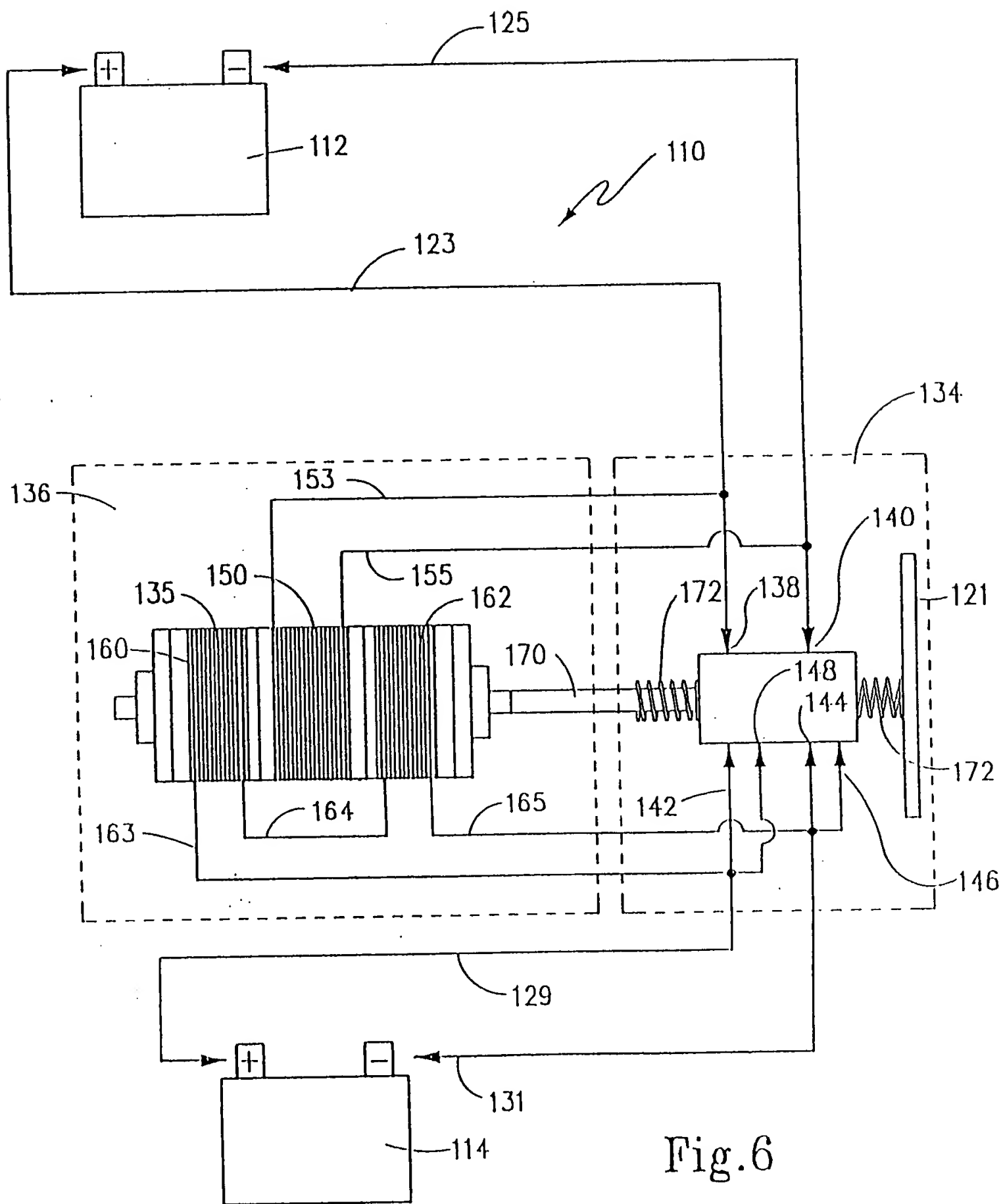


Fig.6

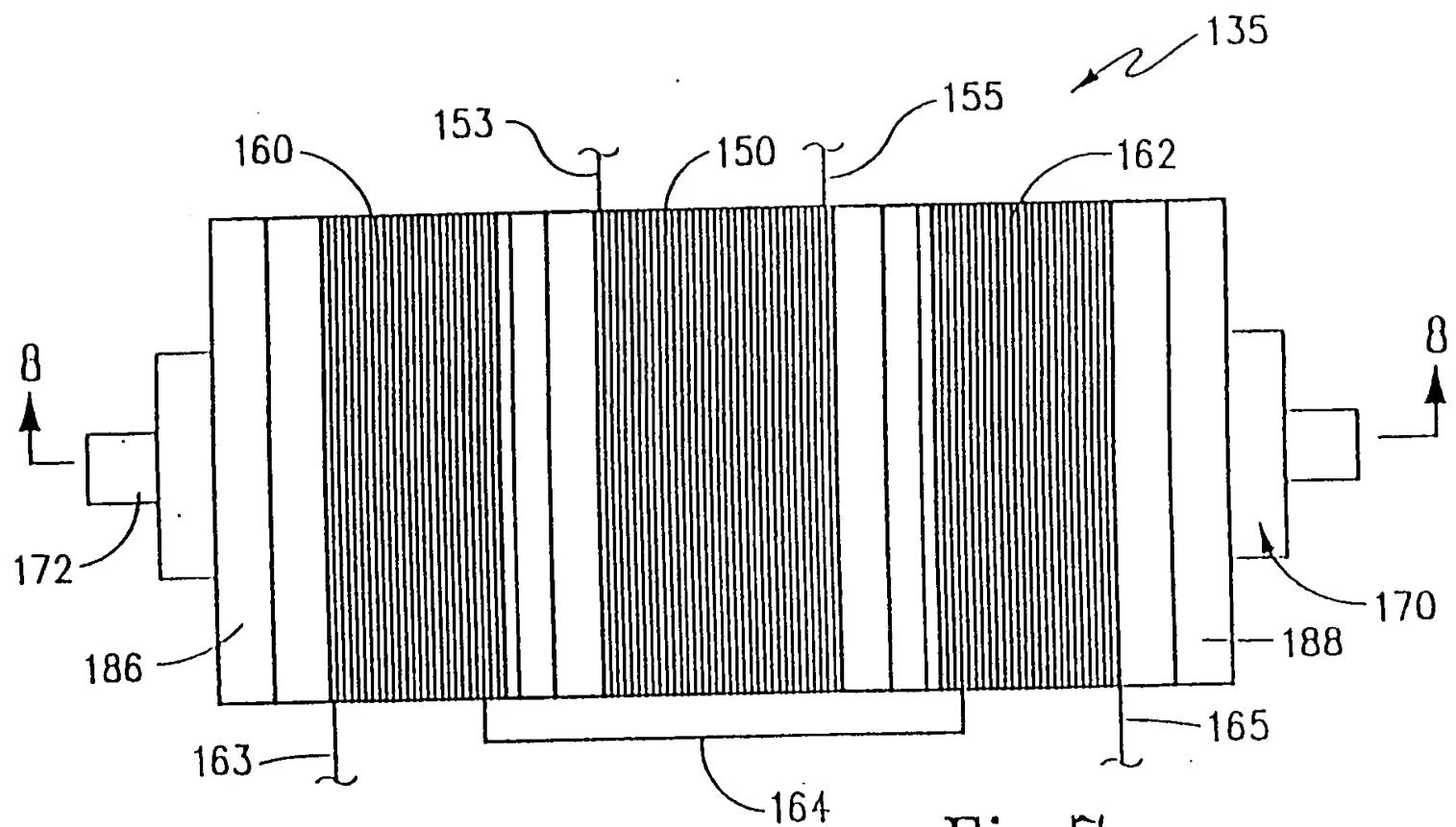


Fig. 7

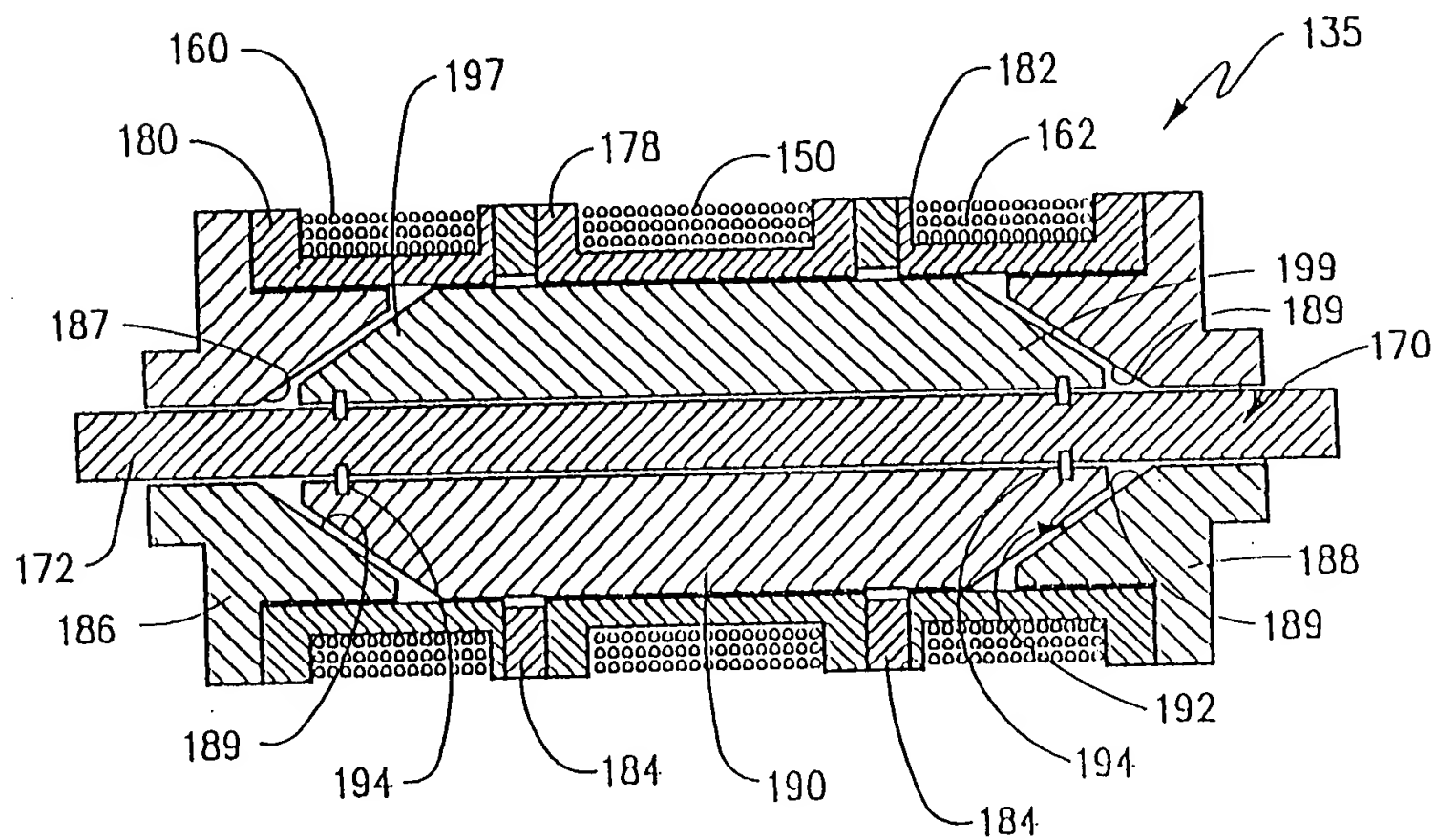


Fig. 8

PATENT COOPERATION TREATY

SEP 08 1997

PCT

NOTIFICATION OF RECEIPT OF
RECORD COPY

(PCT Rule 24.2(a))

From the INTERNATIONAL BUREAU

To:

MARTIN, Timothy, J.
Timothy J. Martin, P.C.
Suite 200
9250 W. 5th Avenue
Lakewood, CO 80226
ETATS-UNIS D'AMERIQUE

Date of mailing (day/month/year) 27 August 1997 (27.08.97)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference DN 1627	International application No. PCT/US97/12310

The applicant is hereby notified that the International Bureau has received the record copy of the international application as detailed below.

Name(s) of the applicant(s) and State(s) for which they are applicants:

SMITH, Jerry, R. (all designated States)

International filing date : 09 July 1997 (09.07.97)

Priority date(s) claimed : 09 July 1996 (09.07.96)

Date of receipt of the record copy
by the International Bureau : 26 August 1997 (26.08.97)

List of designated Offices

EP : AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE
National : AU, BR, CA, JP, MX, US

ATTENTION

The applicant should carefully check the data appearing in this Notification. In case of any discrepancy between these data and the indications in the international application, the applicant should immediately inform the International Bureau.

In addition, the applicant's attention is drawn to the information contained in the Annex, relating to:

- ☒ time limits for entry into the national phase;
☒ confirmation of precautionary designations;
☐ requirements regarding priority documents.

A copy of this Notification is being sent to the receiving Office and to the International Searching Authority.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. (41-22) 740.14.35	Authorized officer: Nathalie Fischer Telephone No. (41-22) 338.83.38
--	--

INFORMATION ON TIME LIMITS FOR ENTERING THE NATIONAL PHASE

The applicant is reminded that the "national phase" must be entered before each of the designated Offices indicated in the Notification of Receipt of Record Copy (Form PCT/IB/301) by paying national fees and furnishing translations, as prescribed by the applicable national laws.

The time limit for performing these procedural acts is 20 MONTHS from the priority date or, for those designated States which the applicant elects in a demand for international preliminary examination or in a later election, 30 MONTHS from the priority date, provided that the election is made before the expiry of 19 months from the priority date. Some designated (or elected) Offices have fixed time limits which expire even later than 20 or 30 months from the priority date. In other Offices an extension of time or grace period, in some cases upon payment of an additional fee, is available.

In addition to these procedural acts, the applicant may also have to comply with other special requirements applicable in certain Offices. It is the applicant's responsibility to ensure that the necessary steps to enter the national phase are taken in a timely fashion. Most designated Offices do not issue reminders to applicants in connection with the entry into the national phase.

For detailed information about the procedural acts to be performed to enter the national phase before each designated Office, the applicable time limits and possible extensions of time or grace periods, and any other requirements, see the relevant Chapters of Volume II of the PCT Applicant's Guide. Information about the requirements for filing a demand for international preliminary examination is set out in Chapter IX of Volume I of the PCT Applicant's Guide.

Note that since ES is not bound by PCT Chapter II (which provides for the international preliminary examination procedure), that State cannot be elected in a demand for international preliminary examination. In the case of the designation of ES for a national patent, the applicant must thus always enter the national phase before the national Office of that State before the expiration of 20 months from the priority date. In the case of the designation of ES for a European patent, however, the 31-month time limit applies in respect of that designation if at least one other State designated for a European patent is also elected within the 19-month period.*

Note also that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

- * CH and LI became bound by PCT Chapter II on 1 September 1995. GR became bound by PCT Chapter II on 7 September 1996. Therefore, CH and LI may be elected in a demand or a later election filed on or after 1 September 1995, and GR may be elected in a demand or a later election filed on or after 7 September 1996, regardless of the filing date of the international application. (See 2nd paragraph above.)

CONFIRMATION OF PRECAUTIONARY DESIGNATIONS

This notification lists only specific designations made under Rule 4.9(a) in the request. It is important to check that these designations are correct. Errors in designations can be corrected where precautionary designations have been made under Rule 4.9(b). The applicant is hereby reminded that any precautionary designations may be confirmed according to Rule 4.9(c) before the expiration of 15 months from the priority date. If it is not confirmed, it will automatically be regarded as withdrawn by the applicant. There will be no reminder and no invitation. Confirmation of a designation consists of the filing of a notice specifying the designated State concerned (with an indication of the kind of protection or treatment desired) and the payment of the designation and confirmation fees. Confirmation must reach the receiving Office within the 15-month time limit.

REQUIREMENTS REGARDING PRIORITY DOCUMENTS

For applicants who have not yet complied with the requirements regarding priority documents the following is recalled.

Where the priority of an earlier national (i.e., national or regional) application is claimed, the applicant must submit a copy of the said national application, certified by the authority with which it was filed ("the priority document") to the receiving Office (which will transmit it to the International Bureau) or directly to the International Bureau, before the expiration of 16 months from the priority date (Rule 17.1).

Where the priority document is issued by the receiving Office, the applicant may, instead of submitting the priority document, request the receiving Office to prepare and transmit the priority document to the International Bureau. Such a request must be made before the expiration of the 16-month time limit.

It is recalled that, where several priorities are claimed, the priority date to be considered for the purposes of computing the 16-month time limit is the filing date of the earliest application whose priority is claimed.

If the priority document concerned is not submitted to the International Bureau before the expiration of the 16-month time limit, or if the request to the receiving Office to transmit the priority document has not been made (and the corresponding fee, if any, paid) before the expiration of this time limit, any designated State may disregard the priority claim.

PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL BUREAU

NOTIFICATION CONCERNING
SUBMISSION OF PRIORITY DOCUMENTS

(PCT Administrative Instructions, Section 411)

To:

MARTIN, Timothy, J.
Timothy J. Martin, P.C.
Suite 200
9250 W. 5th Avenue
Lakewood, CO 80226
ETATS-UNIS D'AMERIQUE

OCT 30 1997

Date of mailing (day/month/year)

15 October 1997 (15.10.97)

Applicant's or agent's file reference

DN 1627

IMPORTANT NOTIFICATION

International application No.

PCT/US97/12310

International filing date (day/month/year)

09 July 1997 (09.07.97)

Priority date (day/month/year)

09 July 1996 (09.07.96)

Applicant

SMITH, Jerry, R.

The applicant is hereby notified of the date of receipt by the International Bureau of the priority document(s) relating to the following application(s):

Priority application No.:Priority date:Priority country:Date of receipt of priority document:

60/021,435

09 Jul 1996 (09.07.96)

US

10 Oct 1997 (10.10.97)

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer

K. Andreasson

Telephone No.: (41-22) 338.83.38

NOV 14 1997

From the INTERNATIONAL SEARCHING AUTHORITY

To: TIMOTHY J. MARTIN
TIMOTHY J. MARTIN, P.C.
9250 W. 5TH AVENUE, SUITE 200
LAKEWOOD, CO 80226

PCT

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL SEARCH REPORT
OR THE DECLARATION

(PCT Rule 44.1)

Date of Mailing (day/month/year) 12 NOV 1997	
Applicant's or agent's file reference DN 1627	FOR FURTHER ACTION See paragraphs 1 and 4 below
International application No. PCT/US97/12310	International filing date (day/month/year) 09 JULY 1997
Applicant Jerry R. Smith	

1. ☒ The applicant is hereby notified that the international search report has been established and is transmitted herewith.
 Filing of amendments and statement under Article 19:
 The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):
 When? The time limit for filing such amendments is normally 2 months from the date of transmittal of the international search report; however, for more details, see the notes on the accompanying sheet.
 Where? Directly to the International Bureau of WIPO
 34, chemin des Colombettes
 1211 Geneva 20, Switzerland
 Facsimile No.: (41-22) 740.14.35
 For more detailed instructions, see the notes on the accompanying sheet.
2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect is transmitted herewith.
3. ☐ With regard to the protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:
 - ☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.
 - ☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.
4. Further action(s): The applicant is reminded of the following:

Shortly after 18 months from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in rules 90 bis 1 and 90 bis 3, respectively, before the completion of the technical preparations for international publication.

Within 19 months from the priority date, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later).

Within 20 months from the priority date, the applicant must perform the prescribed acts for entry into the national phase before all designated Offices which have not been elected in the demand or in a later election within 19 months from the priority date or could not be elected because they are not bound by Chapter II.

Name and mailing address of the ISA/US
Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231
Facsimile No. (703) 305-3230

Authorized officer
PETER GANJIAN

Telephone No. (703) 308-1655

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference DN 1627	<div style="display: flex; justify-content: space-between;"> <div style="text-align: center;">FOR FURTHER ACTION</div> <div>see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.</div> </div>	
International application No. PCT/US97/12310	International filing date (day/month/year) 09 JULY 1997	(Earliest) Priority Date (day/month/year) 09 JULY 1996
Applicant Jerry R. Smith		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. ☐ Certain claims were found unsearchable (See Box I).

2. ☐ Unity of invention is lacking (See Box II).

3. ☐ The international application contains disclosure of a nucleotide and/or amino acid sequence listing and the international search was carried out on the basis of the sequence listing

☐ filed with the international application.
☐ furnished by the applicant separately from the international application,

☐ but not accompanied by a statement to the effect that it did not include matter going beyond the disclosure in the international application as filed.

☐ transcribed by this Authority.

4. With regard to the title,

☒ the text is approved as submitted by the applicant.
☐ the text has been established by this Authority to read as follows:

5. With regard to the abstract,

☐ the text is approved as submitted by the applicant.
☒ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is:

Figure No. 2

☐ as suggested by the applicant.

☐ None of the figures.

☐ because the applicant failed to suggest a figure.
☒ because this figure better characterizes the invention.

Box III TEXT OF THE ABSTRACT (Continuation of Item 5 of the first sheet)

NEW ABSTRACT

An electro-mechanical switching device (10) ensures automatic selected polarity interconnection between terminals of two power sources (14, 12). A double pole double throw (DPDT) switch (34) has three pairs of contacts. A first pair of leads connect to two pairs of contacts in a manner that reverses polarity when switched, while a second pair of leads connect to the other pair of contacts. A switch controller (36) employs a plurality of coils in electrical communication with the two pairs of leads. The coils are arranged and configured so that, when the two pairs of leads are connected to the respective power sources (14, 12), the coils cause an actuator to move the switch (34) automatically into the correct polarity state regardless of the connections of the leads. The invention is described as a battery jumper cable and to automatically connect like terminals of a pair of batteries (14, 12). The invention encompasses the method of this device.

INTERNATION EARCH REPORT

International application No.
PCT/US97/12310

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : H02B 1/24

US CL : 307/127

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 307/127, 10.1, 10.7, 9.1, 130, 131, 10.8, 134, 138; 361/84, 82, 77, 79, 42, 246, 245; 320/25, 26; 340/636;

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,539,610 A (WILLIAMS ET AL) 23 JULY 1996 (23/07/96), FIG.1-4.	1-14
Y	US 4,471,400 A (REZA) 11 SEPTEMBER 1984 (11/09/84), FIG. 1.	1-14
Y	US 4,520,419 A (LOCHER ET AL) 28 MAY 1985 (28/05/85), FIG 1.	1-14
Y	US 4,857,985 A (MILLER) 15 AUGUST 1989 (15/08/89), FIG 1-2	1-14

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier document published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

10 OCTOBER 1997

Date of mailing of the international search report

12 NOV 1997

Name and mailing address of the ISA/US
Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231

Facsimile No. (703) 305-3230

Authorized officer

PETER GANJIAN

Telephone No. (703) 308-1655

NOTES TO FORM PCT/ISA/220

These Notes are intended to give the basic instructions concerning the filing of amendments under Article 19. The Notes are based on the requirements of the Patent Cooperation Treaty and of the Regulations and the Administrative Instructions under that Treaty. In case of discrepancy between these Notes and those requirements, the latter are applicable. For more detailed information, see also the PCT Applicant's Guide, a publication of WIPO.

In these Notes, "Article", "Rule" and "Section" refer to the provisions of the PCT, the PCT Regulations and the PCT Administrative Instructions, respectively.

INSTRUCTIONS CONCERNING AMENDMENTS UNDER ARTICLE 19

The applicant has, after having received the international search report, one opportunity to amend the claims of the international application. It should however be emphasized that, since all parts of the international application (claims, description and drawings) may be amended during the international preliminary examination procedure, there is usually no need to file amendments of the claims under Article 19 except where, e.g. the applicant wants the latter to be published for the purposes of provisional protection or has another reason for amending the claims before international publication. Furthermore, it should be emphasized that provisional protection is available in some States only.

What parts of the international application may be amended ?

The claims only.

The description and the drawings may only be amended during international preliminary examination under Chapter II.

When ? Within 2 months from the date of transmittal of the international search report or 16 months from the priority date, whichever time limit expires later. It should be noted, however, that the amendments will be considered as having been received on time if they are received by the International Bureau after the expiration of the applicable time limit but before the completion of the technical preparations for international publication (Rule 46.1).

Where not to file the amendments ?

The amendments may only be filed with the International Bureau and not with the receiving Office or the International Searching Authority (Rule 46.2).

Where a demand for international preliminary examination has been/is filed, see below.

How ? Either by cancelling one or more entire claims, by adding one or more new claims or by amending the text of one or more of the claims as filed.

A replacement sheet must be submitted for each sheet of the claims which, on account of an amendment or amendments, differs from the sheet originally filed.

All the claims appearing on a replacement sheet must be numbered in Arabic numerals. Where a claim is cancelled, no renumbering of the other claims is required. In all cases where claims are renumbered, they must be renumbered consecutively (Administrative Instructions, Section 205(b)).

What documents must/may accompany the amendments ?

Letter (Section 205(b)):

The amendments must be submitted with a letter.

The letter will not be published with the international application and the amended claims. It should not be confounded with the "Statement under Article 19(1)" (see below, under "Statement under Article 19(1)").

The letter must indicate the differences between the claims as filed and the claims as amended. It must, in particular, indicate, in connection with each claim appearing in the international application (it being understood that identical indications concerning several claims may be grouped), whether

- (i) the claim is unchanged;
- (ii) the claim is cancelled;
- (iii) the claim is new;
- (iv) the claim replaces one or more claims as filed;
- (v) the claim is the result of the division of a claim as filed.

NOTES TO FORM PCT/ISA/220 (continued)

The following examples illustrate the manner in which amendments must be explained in the accompanying letter:

1. [Where originally there were 48 claims and after amendment of some claims there are 51]:
"Claims 1 to 29, 31, 32, 34, 35, 37 to 48 replaced by amended claims bearing the same numbers; claims 30, 33 and 36 unchanged; new claims 49 to 51 added."
2. [Where originally there were 15 claims and after amendment of all claims there are 11]:
"Claims 1 to 15 replaced by amended claims 1 to 11."
3. [Where originally there were 14 claims and the amendments consist in cancelling some claims and in adding new claims]:
"Claims 1 to 6 and 14 unchanged; claims 7 to 13 cancelled; new claims 15, 16 and 17 added." or
"Claims 7 to 13 cancelled; new claims 15, 16 and 17 added; all other claims unchanged."
4. [Where various kinds of amendments are made]:
"Claims 1-10 unchanged; claims 11 to 13, 18 and 19 cancelled; claims 14, 15 and 16 replaced by amended claim 14; claim 17 subdivided into amended claims 15, 16 and 17; new claims 20 and 21 added."

"Statement under Article 19(1)" (Rule 46.4)

The amendments may be accompanied by a statement explaining the amendments and indicating any impact that such amendments might have on the description and the drawings (which cannot be amended under Article 19(1)).

The statement will be published with the international application and the amended claims.

The statement should be brief, it should not exceed 500 words if in English or if translated into English.

It should not be confounded with and does not replace the letter indicating the differences between the claims as filed and as amended. It must be filed on a separate sheet and must be identified as such by a heading, preferably by using the words "Statement under Article 19(1)".

It should not contain any disparaging comments on the international search report or the relevance of citations contained in that report. Reference to citations, relevant to a given claim, contained in the international search report may be made only in connection with an amendment of that claim.

In what language ?

The amendments must be made in the language in which the international application is published. The letter and any statement accompanying the amendments must be in the same language as the international application if that language is English or French; otherwise, it must be in English or French, at the choice of the applicant.

Consequence if a demand for international preliminary examination has already been filed ?

If, at the time of filing any amendments under Article 19, a demand for international preliminary examination has already been submitted, the applicant must preferably, at the same time of filing the amendments with the International Bureau, also file a copy of such amendments with the International Preliminary Examining Authority (see Rule 62.2(a), first sentence).

Consequence with regard to translation of the international application for entry into the national phase ?

The applicant's attention is drawn to the fact that, where upon entry into the national phase, a translation of the claims as amended under Article 19 may have to be furnished to the designated/elected Offices, instead of, or in addition to, the translation of the claims as filed.

For further details on the requirements of each designated/elected Office, see Volume II of the PCT Applicant's Guide.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

RE: PCT Patent Application for : Dated: January 9, 1998
Jerry R. Smith :
PCT International Application No.: :
PCT/US9712310 : Action: TRANSMITTAL OF
PCT International Filing Date: : PCT DEMAND
July 9, 1997 :
FOR: ELECTROMECHANICAL SWITCHING :
DEVICE :

To: The Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231

Sir:

Enclosed for filing please find the PCT Demand and Fee Calculation Sheet in reference to the above identified PCT Patent Application. Also enclosed is check no. 12145 in the amount of \$652.00 for the filing fee.

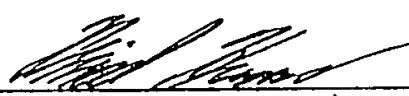
The Commissioner is hereby authorized to charge any deficiency in the payment of the required fee(s) or credit any overpayment to Deposit Account No. 13-1940.

If you have any questions concerning this matter, please contact the undersigned attorney.

Respectfully submitted,

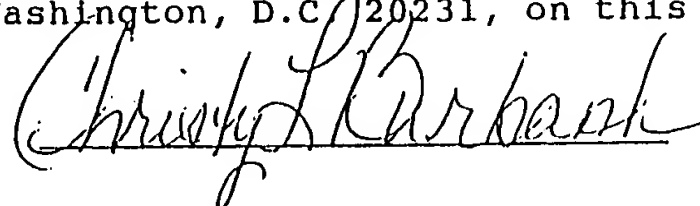
TIMOTHY J. MARTIN, P.C.

By:


Timothy J. Martin, #28,640
Michael R. Henson, #39,222
9250 W. 5th Avenue, Suite 200
Lakewood, Colorado 80226
(303) 232-3388

CERTIFICATE OF MAILING UNDER 37 C.F.R. 1.10

I hereby certify that the foregoing TRANSMITTAL OF PCT DEMAND and check no. 12145 in the amount of \$652.00 is being deposited with the United States Postal Service as EXPRESS MAIL, LABEL NO. EI627082883US, The Commissioner of Patents and Trademarks Office, Box PCT, Washington, D.C. 20231, on this 9th day of January, 1998.



The demand must be filed directly with the one chosen by the applicant.

Competent International Preliminary Examining Authority. If two or more Authorities are competent, all name or two-letter code of that Authority may be indicated by the applicant on the line below:

IPEA/ US

PCT

CHAPTER II

DEMAND

under Article 31 of the Patent Cooperation Treaty:
The undersigned requests that the international application specified below be the subject of international preliminary examination according to the Patent Cooperation Treaty.

For International Preliminary Examining Authority use only	
Identification of IPEA	Date of receipt of DEMAND
Box No. I IDENTIFICATION OF THE INTERNATIONAL APPLICATION	
International application No. PCT/US97/12310	Applicant's or agent's file reference DN 1627 PCT
International filing date (day/month/year) (09.07.97) 09 July 1997	(Earliest) Priority date (day/month/year) (09.07.96) 09 July 1996
Title of Invention ELECTROMECHANICAL SWITCHING DEVICE	
Box No. II APPLICANT(S)	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) SMITH, Jerry R. 5690 West Rowland Avenue Littleton, Colorado 80123 United States of America	Telephone No.: (303) 797-3029 Facsimile No.: (303) 794-4906 Teleprinter No.:
State (i.e. country) of nationality: United States of America	State (i.e. country) of residence: United States of America
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) 	
State (i.e. country) of nationality:	State (i.e. country) of residence:
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) 	
State (i.e. country) of nationality:	State (i.e. country) of residence:
<input type="checkbox"/> Further applicants are indicated on a continuation sheet.	

Box No. III AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The following person is ☒ agent ☐ common representativeand ☒ has been appointed earlier and represents the applicant(s) also for international preliminary examination.☐ is hereby appointed and any earlier appointment of (an) agent(s)/common representative is hereby revoked.☐ is hereby appointed, specifically for the procedure before the International Preliminary Examining Authority, in addition to the agent(s)/common representative appointed earlier.Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*HENSON, Michael R.
MARTIN, Timothy J.
9250 W. 5th Avenue, Suite 200
Lakewood, Colorado 80226
United States of America

Telephone No.:

(303) 232-3388

Facsimile No.:

(303) 232-3288

Teleprinter No.:



Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

Box No. IV STATEMENT CONCERNING AMENDMENTS

The applicant wishes the International Preliminary Examining Authority*

(i) ☒ to start the international preliminary examination on the basis of the international application as originally filed.(ii) ☐ to take into account the amendments under Article 34 of☐ the description (amendments attached).☐ the claims (amendments attached).☐ the drawings (amendments attached).(iii) ☐ to take into account any amendments of the claims under Article 19 filed with the International Bureau (a copy is attached).(iv) ☐ to disregard any amendments of the claims made under Article 19 and to consider them as reversed.(v) ☐ to postpone the start of the international preliminary examination until the expiration of 20 months from the priority date unless that Authority receives a copy of any amendments made under Article 19 or a notice from the applicant that he does not wish to make such amendments (Rule 69.1(d)). *(This check-box may be marked only where the time limit under Article 19 has not yet expired.)*

* Where no check-box is marked, international preliminary examination will start on the basis of the international application as originally filed or, where a copy of amendments to the claims under Article 19 and/or amendments of the international application under Article 34 are received by the International Preliminary Examining Authority before it has begun to draw up a written opinion or the international preliminary examination report, as so amended.

Box No. V ELECTION OF STATES



The applicant hereby elects all eligible States (that is, all States which have been designated and which are bound by Chapter II of the PCT) except

.....
.....
.....*(If the applicant does not wish to elect certain eligible States, the name(s) or country code(s) of those States must be indicated above.)*

Box No. VI CHECK LIST

The demand is accompanied by the following documents for the purposes of International preliminary examination:

- | | | |
|--|---|--------|
| 1. amendments under Article 34 | | |
| description | : | sheets |
| claims | : | sheets |
| drawings | : | sheets |
| 2. letter accompanying amendments under Article 34 | : | sheets |
| 3. copy of amendments under Article 19 | : | sheets |
| 4. copy of statement under Article 19 | : | sheets |
| 5. other (specify): | : | sheets |

For International Preliminary
Examining Authority use only

received not received

<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>

The demand is also accompanied by the item(s) marked below:

- | | |
|--|---|
| 1. <input type="checkbox"/> separate signed power of attorney | 4. <input checked="" type="checkbox"/> fee calculation sheet |
| 2. <input type="checkbox"/> copy of general power of attorney | 5. <input checked="" type="checkbox"/> other (specify): return postcard |
| 3. <input type="checkbox"/> statement explaining lack of signature | |

Box No. VII SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the demand).



Michael R. Henson, Agent for Applicant

For International Preliminary Examining Authority use only

1. Date of actual receipt of DEMAND:

2. Adjusted date of receipt of demand due to CORRECTIONS under Rule 60.1(b):

3. ☐ The date of receipt of the demand is AFTER the expiration of 19 months from the priority date and item 4 or 5, below, does not apply. ☐ The applicant has been informed accordingly.

4. ☐ The date of receipt of the demand is WITHIN the period of 19 months from the priority date as extended by virtue of Rule 80.5.

5. ☐ Although the date of receipt of the demand is after the expiration of 19 months from the priority date, the delay in arrival is EXCUSED pursuant to Rule 82.

For International Bureau use only

Demand received from IPEA on:

PCT

FEE CALCULATION SHEET

Annex to the Demand for international preliminary examination

International application No. PCT/US97/12310	For International Preliminary Examining Authority use only	
Applicant's or agent's file reference DN 1627 PCT	Date stamp of the IPEA	
Applicant Jerry R. Smith		
Calculation of prescribed fees		
1. Preliminary examination fee	<div style="border: 1px solid black; display: inline-block; padding: 2px 10px;">\$490.00</div> <div style="border: 1px solid black; display: inline-block; padding: 2px 5px; margin-left: 5px;">P</div>	
2. Handling fee <i>(Applicants from certain States are entitled to a reduction of 75% of the handling fee. Where the applicant is (or all applicants are) so entitled, the amount to be entered at II is 25% of the handling fee.)</i>	<div style="border: 1px solid black; display: inline-block; padding: 2px 10px;">\$162.00</div> <div style="border: 1px solid black; display: inline-block; padding: 2px 5px; margin-left: 5px;">H</div>	
3. Total of prescribed fees Add the amounts entered at P and H and enter total in the TOTAL box	<div style="border: 1px solid black; display: inline-block; padding: 2px 10px;">\$652.00</div>	
	<div style="border: 1px solid black; display: inline-block; padding: 2px 10px;">TOTAL</div>	
Mode of Payment		
<input checked="" type="checkbox"/> authorization to charge deposit account with the IPEA (see below)	<input type="checkbox"/> cash	
<input checked="" type="checkbox"/> cheque check no. <u>12145</u>	<input type="checkbox"/> revenue stamps	
<input type="checkbox"/> postal money order	<input type="checkbox"/> coupons	
<input type="checkbox"/> bank draft	<input type="checkbox"/> other (specify):	
Deposit Account Authorization <i>(this mode of payment may not be available at all IPEAs)</i>		
The IPEA/ <u>US</u> <input type="checkbox"/> is hereby authorized to charge the total fees indicated above to my deposit account.		
<input checked="" type="checkbox"/> <i>(this check-box may be marked only if the conditions for deposit accounts of the IPEA so permit)</i> is hereby authorized to charge any deficiency or credit any overpayment in the total fees indicated above to my deposit account.		
<u>13-1940</u> Deposit Account Number	<u>09/01/98</u> Date (day/month/year)	 Signature

PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL BUREAU

To:

MARTIN, Timothy, J.
Timothy J. Martin, P.C.
Suite 200
9250 W. 5th Avenue
Lakewood, CO 80226
ETATS-UNIS D'AMERIQUE

NOTICE INFORMING THE APPLICANT OF THE
COMMUNICATION OF THE INTERNATIONAL
APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

Date of mailing (day/month/year)

15 January 1998 (15.01.98)

Applicant's or agent's file reference

DN 1627

IMPORTANT NOTICE

International application No.

PCT/US97/12310

International filing date (day/month/year)

09 July 1997 (09.07.97)

Priority date (day/month/year)

09 July 1996 (09.07.96)

Applicant

SMITH, Jerry, R.

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:

AU, BR, CA, EP, JP, US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:

MX

The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on

15 January 1998 (15.01.98) under No. WO 98/01928

REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a demand for international preliminary examination must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the national phase, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. (41-22) 740.14.35

Authorized officer

J. Zahra

Telephone No. (41-22) 338.83.38

PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

TIMOTHY J. MARTIN
TIMOTHY J. MARTIN, P.C.
9250 W. 5TH AVENUE
SUITE 200
LAKEWOOD CO 80226

PCT
FEB 12 1998
RECEIVED
NOTIFICATION FOR RECEIPT
OF DEMAND

(PCT Rule 61.1(b), first sentence
and Administrative Instructions, Section 601)

Date of mailing (day/month/year) 09 FEB 1998	
Applicant's or agent's file reference DN 1627	IMPORTANT NOTIFICATION
International application No. PCT/US97/12310	International filing date (day/month/year) 09 JUL 97
Priority date (day/month/year) 09 JUL 96	
Applicant SMITH, JERRY R.	

1. The applicant is hereby notified that this International Preliminary Examining Authority considers the following date as the date of receipt of the demand for international preliminary examination of the international application:

09 JAN 1998

2. This date of receipt is:

- ☒ the actual date of receipt of the demand.
☐ the date on which the proper corrections to the demand were timely received.

3. ☐ This date is AFTER the expiration of 19 months from the priority date.

Attention: The election(s) made in the demand does (do) not have the effect of postponing the commencement of the national phase until 30 months from the priority date (or later in some Offices) (Article 39(1)). Therefore, the acts for entry into the national phase must be performed within 20 months from the priority date (or later in some Offices) (Article 22).

For details, see Annex B to Form PCT/IB/301 sent by the International Bureau and Volume II of the PCT Applicant's Guide.

- ☐ This notification confirms the information given in person or by telephone on:

4. Only where paragraph 3 applies, a copy of this notification has been sent to the International Bureau.

Name and mailing address of the IPEA/US Assistant Commissioner for Patents Box PCT Washington, D.C. 20231 Facsimile No.	Authorized officer Virginia Irby <i>Virginia Irby</i> Paralegal Specialist IAPD - PCT Operations Telephone No. (703) 305-3748
---	---

PATENT COOPERATION TREATY

PCT

INFORMATION CONCERNING ELECTED
OFFICES NOTIFIED OF THEIR ELECTION

(PCT Rule 61.3)

From the INTERNATIONAL BUREAU

To:

MARTIN, Timothy, MAR 11 1998
 Timothy J. Martin, P.C.
 Suite 200
 9250 W. 5th Avenue
 Lakewood, CO 80226
 ETATS-UNIS D'AMERIQUE

Date of mailing (day/month/year)

24 February 1998 (24.02.98)

Applicant's or agent's file reference

DN 1627

IMPORTANT INFORMATION

International application No.

PCT/US97/12310

International filing date (day/month/year)

09 July 1997 (09.07.97)

Priority date (day/month/year)

09 July 1996 (09.07.96)

Applicant

SMITH, Jerry, R.

1. The applicant is hereby informed that the International Bureau has, according to Article 31(7), notified each of the following Offices of its election:

EP : AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE

National : AU, BR, CA, JP, US

2. The following Offices have waived the requirement for the notification of their election; the notification will be sent to them by the International Bureau only upon their request:

National : MX

3. The applicant is reminded that he must enter the "national phase" before the expiration of 30 months from the priority date before each of the Offices listed above. This must be done by paying the national fee(s) and furnishing, if prescribed, a translation of the international application (Article 38(1)(a)), as well as, where applicable, by furnishing a translation of any annexes of the international preliminary examination report (Article 36(3)(b) and Rule 74.1).

Some offices have fixed time limits expiring later than the above-mentioned time limit. For detailed information about the applicable time limits and the acts to be performed upon entry into the national phase before a particular Office, see Volume II of the PCT Applicant's Guide.

The entry into the European regional phase is postponed until 31 months from the priority date for all States designated for the purposes of obtaining a European patent.

The International Bureau of WIPO
 34, chemin des Colombettes
 1211 Geneva 20, Switzerland

Facsimile No. (41-22) 740.14.36

Authorized officer:

N. Fischer

Telephone No. (41-22) 338.83.38

PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT

To: TIMOTHY J. MARTIN
TIMOTHY J. MARTIN, P.C.
9250 W. 5TH AVENUE, SUITE 200
LAKEWOOD, CO 80226

APR 17 1998

**NOTIFICATION OF TRANSMITTAL OF
INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

(PCT Rule 71.1)

Date of Mailing
(day/month/year)

13 APR 1998

Applicant's or agent's file reference

DN 1627

IMPORTANT NOTIFICATION

International application No.

PCT/US97/12310

International filing date (day/month/year)

09 JULY 1997

Priority Date (day/month/year)

09 JULY 1996

Applicant

SMITH, JERRY R.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.

2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.

3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices)(Article 39(1))(see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/US
Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231

Facsimile No. (703) 305-3230

Authorized officer

William Shoop

Telephone No. (703) 308-1655

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

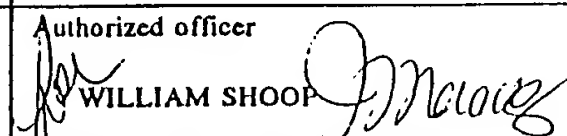
(PCT Article 36 and Rule 70)

Applicant's or agent's file reference DN 1627	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/US97/12310	International filing date (day/month/year) 09 JULY 1997	Priority date (day/month/year) 09 JULY 1996
International Patent Classification (IPC) or national classification and IPC IPC(6): H02B 1/24 and US Cl.: 307/127		
Applicant SMITH, JERRY R.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 3 sheets.
- ☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority. (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).
- These annexes consist of a total of — sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☒ Priority
- III ☐ Non-establishment of report with regard to novelty, inventive step or industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 09 JANUARY 1998	Date of completion of this report 13 FEBRUARY 1998
Name and mailing address of the IPEA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer  WILLIAM SHOOP Telephone No. (703) 308-1655

I. Basis of the report

1. This report has been drawn on the basis of *(Substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments):*

☒ the international application as originally filed.

☒ the description, pages 1-15, as originally filed.

pages NONE, filed with the demand.

pages NONE, filed with the letter of _____.

pages _____, filed with the letter of _____.

☒ the claims, Nos. 1-16, as originally filed.

Nos. NONE, as amended under Article 19.

Nos. NONE, filed with the demand.

Nos. NONE, filed with the letter of _____.

Nos. _____, filed with the letter of _____.

☒ the drawings, sheets/fig 1-5, as originally filed.

sheets/fig NONE, filed with the demand.

sheets/fig NONE, filed with the letter of _____.

sheets/fig _____, filed with the letter of _____.

2. The amendments have resulted in the cancellation of:

☒ the description, pages None.

☒ the claims, Nos. None.

☒ the drawings, sheets/fig None.

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the ~~Supplemental Box~~ Additional observations below (Rule 70.2(c)).

4. Additional observations, if necessary:

NONE

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**1. STATEMENT**

Novelty (N)	Claims <u>1-16</u>	YES
	Claims <u>None</u>	NO
Inventive Step (IS)	Claims <u>1-16</u>	YES
	Claims <u>None</u>	NO
Industrial Applicability (IA)	Claims <u>1-16</u>	YES
	Claims <u>NONE</u>	NO

2. CITATIONS AND EXPLANATIONS

Claims 1-16 meet the criteria set out in PCT Article 33(2)-(4), because the prior art does not teach or fairly suggest the detail circuit topography being claimed.

----- NEW CITATIONS -----

NONE

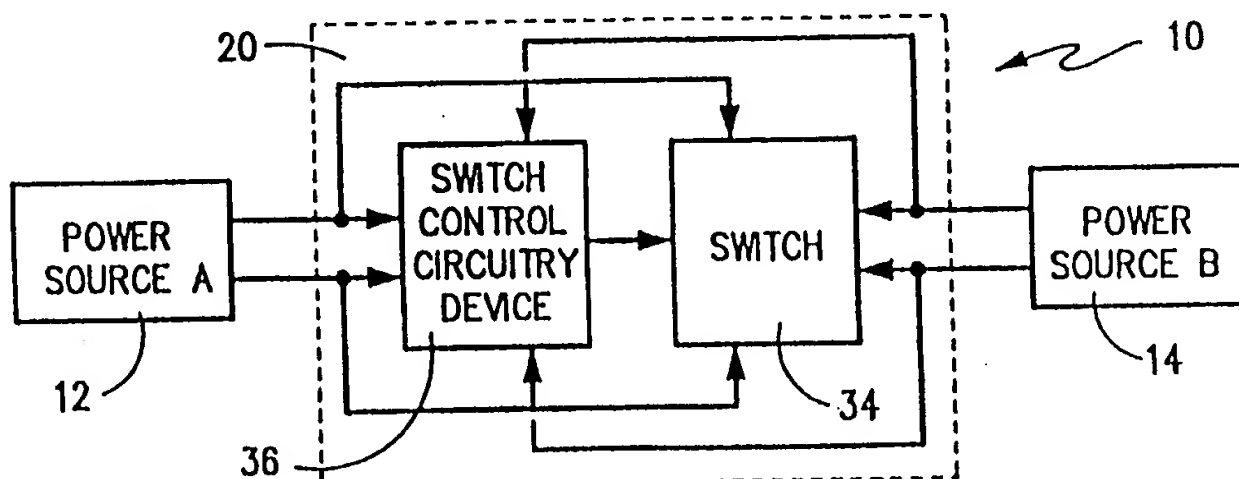
PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : H02B 1/24	A1	(11) International Publication Number: WO 98/01928 (43) International Publication Date: 15 January 1998 (15.01.98)
(21) International Application Number: PCT/US97/12310 (22) International Filing Date: 9 July 1997 (09.07.97) (30) Priority Data: 60/021,435 9 July 1996 (09.07.96) US (71)(72) Applicant and Inventor: SMITH, Jerry, R. [US/US]; 5690 W. Rowland Avenue, Littleton, CO 80123 (US). (74) Agents: MARTIN, Timothy, J. et al.; Timothy J. Martin, P.C., Suite 200, 9250 W. 5th Avenue, Lakewood, CO 80226 (US).		(81) Designated States: AU, BR, CA, JP, MX, US, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: ELECTROMECHANICAL SWITCHING DEVICE



(57) Abstract

An electromechanical switching device (10) ensures automatic selected polarity interconnection between terminals of two power sources (14, 12). A double pole double throw (DPDT) switch (34) has three pairs of contacts. A first pair of leads connect to two pairs of contacts in a manner that reverses polarity when switched, while a second pair of leads connect to the other pair of contacts. A switch controller (36) employs a plurality of coils in electrical communication with the two pairs of leads. The coils are arranged and configured so that, when the two pairs of leads are connected to the respective power sources (14, 12), the coils cause an actuator to move the switch (34) automatically into the correct polarity state regardless of the connections of the leads. The invention is described as a battery jumper cable and to automatically connect like terminals of a pair of batteries (14, 12). The invention encompasses the method of this device.

ELECTROMECHANICAL SWITCHING DEVICE

RELATED APPLICATION

This application claims the benefit of U.S. Provisional Application No. 60/021,435, filed July 9, 1996.

FIELD OF INVENTION

The present invention is directed to electromechanical switches for automatically providing a desired polarity connection between two sources of power. Though not by way of limitation, the present invention finds particular application in the automotive field in order to properly interconnect like terminals of a pair of vehicle batteries for recharging.

BACKGROUND OF THE INVENTION

Relays and switches are used in a variety of industrial and commercial applications where there is a need to control power. A relay may be either an electromechanical or solid-state device to control other devices connected to an output. Relays are generally associated with controlling the transmission of electric current in a circuit.

Electromechanical relays are used as switches that make or break a circuit by mechanical operation. Here, an electromagnet moves an armature when current flows through the electromagnet, and the armature acts as a switch. Where the magnetic field produced by a current-carrying coil is used to magnetize and move a plunger, the electromagnet may also be referred to as a solenoid.

It is known to employ either electromechanical or solid-state switches in order to ensure proper polarity connection between two sources of power. One exemplary application for such use is in the automotive field for the purpose of interconnecting rechargeable batteries. It is not uncommon for vehicles having rechargeable batteries, such as automobiles, busses, trucks, etc. and even watercraft to require boosts on their batteries from external sources of DC power. For example, in emergency situations, it may be necessary to jump-start a vehicle by connecting one vehicle's "dead" battery to another vehicle's "live" battery. Jumper

cables can be used for this purpose, but it is imperative to connect the batteries with proper polarity, i.e. positive to positive and negative to negative. Failure to do so can potentially cause serious damage to either or both vehicles' electrical systems.

In the past, a variety of techniques have been employed by others to ensure proper interconnection between vehicle batteries. For example, U.S. Patent No. 4,400,658 to Yates, issued August 23, 1983, relates to a battery cable jumper arrangement incorporating a plurality of solenoids and a switching arrangement. A pair of double pole, double throw (DPDT) switches are actuated by the solenoids to ensure correct polarity of connection between the power source and the battery, irrespective of the connected arrangement of the cable pairs. In U.S. Patent No. 5,103,155 to Joannou, issued April 7, 1992, a battery charging system utilizes solid-state components interconnected between two pairs of booster cables. Joannou's device incorporates an electronic polarity sensing, monitoring and alarm circuit and a polarity sensing relay.

SUMMARY OF INVENTION

It is an object of the present invention to provide a new and useful electromechanical switching device which is adapted for interconnection between a pair of power sources and operative to establish electrical communication between desired terminals of the power sources, such as between like terminals.

It is another object of the present invention to provide an electromechanical switching device which utilizes either electromagnetic or solenoid technology to ensure proper interconnection between two power sources.

A further object of the present invention is to provide a new and useful electromechanical switching device which is relatively easy and inexpensive to manufacture.

Yet another object of the present invention is to provide a new and useful methodology for ensuring automatic, desired electrical interconnection between two sources of power.

The present invention is particularly adapted to interconnect like terminals of a pair of power sources. To this end, the invention broadly includes a plurality of current-carrying coils each adapted to electrically connect in a selected connection state to the oppositely polarized terminals associated with the respective one of the power sources to produce an associated magnetic field so that a composite magnetic field is established for the plurality of coils. A switch is then magnetically coupled to the coils and is operative when the coils are connected to the power sources to interact with the composite magnetic field thereby to interconnect the like terminals of the power sources irrespective of the connection states of the coils.

In its basic forms, the invention provides an electromechanical switch device that is operative to electrically interconnect the positive terminal of the first power source to a selected one of the positive and negative terminals of the second power source and a negative terminal of the first power source to the other one of the positive and negative terminals of the second power source thereby to define a selected coupled state. This switching device includes a switch that has first, second and third pairs of contacts with the switch being movable between a first state wherein each of the third pair of contacts is placed in electrical communication with respect to one of the second pair of contacts and a second state wherein each of the third pair of contacts is placed in electrical communication with respect to one of the second pair of contacts.

A first pair of electrical leads have first ends connected to the first pair of contacts and also to the second pair of contacts in a configuration such that the electrical communication between the third electrical contacts and the first pair of the leads is reversed when the switch moves from the first state to the second state. A second pair of electrical leads have first ends connected to the third contacts. Second ends of both the first and second ends of

electrical leads are then adapted to connect respectively to the positive and negative terminals of the first and second power sources.

A switch controller is provided which includes a plurality of current-carrying coils which are in electrical communication with the first and second pairs of electrical leads and an actuator coupled to set switch. The current-carrying coils, when connected to the power sources produce a composite magnetic field with the coils being arranged such that the actuator interacts with the composite magnetic field to automatically move the switch into whichever one of the first and second states results in the interconnection of the first and second power sources in the selected couple state regardless of the respective connections in the second ends of the leads to the power sources.

Preferably, the switch is a double pole double throw switch, and the switch controller includes an inner coil interposed between a pair of outer coils. The inner and outer coils are movable with respect to one another as a result of the magnetic interaction when current flows through the coils. The actuator is then secured to one of the inner and outer coils for common movement therewith thereby to throw the switch. Preferably, the inner and outer coils are spiral wound and axially aligned so that the actuator may move in an axial direction internally of the coils. The actuator is preferably secured to the inner coil while the outer coils are fixed so that reciprocation of the inner coil reciprocates the actuator between first and second positions. The first and second coils are then wound in opposite directions relative to the common coil axis and are electrically interconnected so that, when current is passed therethrough, the first and second coils produce magnetic fields having a common polarity opposed to one another. The outer coils are, for convenience, are wound with a common piece of wire.

Accordingly, the present invention is also directed to a method of ensure proper electrical interconnection between a

pair of power sources. The method includes these steps of producing a first magnetic field associated with a first one of the power sources, and producing a pair of second magnetic fields associate with a second one of the power sources. A switch is then actuated in response to interaction between the first and second magnetic fields thereby to establish electrical interconnection between like terminals of the power sources. This method accomplishes the step of producing the magnetic fields by interconnecting a first power source to a first current-carrying coil and the step of producing the second magnetic field is accomplished by connecting the second power source to a pair of second current-carrying coils in a manner such that the second magnetic fields are oriented oppositely with respect to one another.

These and other objects of the present invention will become more readily appreciated and understood from a consideration of the following detailed description of the exemplary embodiments of the present invention when taken together with the accompanying drawings, in which:

BRIEF DESCRIPTION OF DRAWINGS

Figure 1 is a perspective view of a charging system according to the present invention;

Figure 2 is a diagrammatic view of the charging system shown in Figure 1;

Figure 3 is a circuit diagram showing the principal features of the charging system, and its associated electromechanical switching device, according to a first exemplary embodiment of the present invention;

Figures 4(a) through 4(e) are diagrammatic views illustrating the operation of the electromechanical switching device of Figure 3 in response to various connected states of the two power sources;

Figure 5 is a diagrammatic view illustrating the operation of an electromechanical switching device according to a second embodiment of the present invention;

Figure 6 is a circuit diagram showing the principal features of the charging system, and its associated electromechanical switching device, according to a third exemplary embodiment of the present invention;

Figure 7 is a side view in elevation of the solenoid component for the electromechanical switching device depicted in Figure 6; and

Figure 8 is a cross-sectional view of the solenoid as viewed about lines 8 - 8 in Figure 7.

DETAILED DESCRIPTION OF THE EXEMPLARY EMBODIMENTS

The present invention is directed to an electromechanical switching device that automatically provides desired polarity connection between two sources of power. For example, in the vehicle industry, which includes automobiles, buses, etc. and in the watercraft industry, rechargeable batteries are used to start the vehicle's or boat's engine. Sometimes, it is necessary to utilize the battery of one vehicle or craft to boost-start the engine of another. The present invention provides a means for automatically assuring that correct polarity connections between the electrical systems of two vehicles or water crafts are made. Thus, the present invention is described with this application in mind; however, it should be understood that other applications requiring desired polarity interconnection could employ the technique described herein.

With that in mind, a first exemplary embodiment of the present invention is shown in Figure 1 wherein electromechanical switching device 10 is shown interconnecting two sources of power in the form of a first battery 12 and a second battery 14. Switching device 10 includes a housing 20 and first and second electrical cables 22 and 28. Each of cables 22 and 28 are formed by a pair of electrical leads. Thus, it may be seen that first cable 22 includes a lead 23 that terminates in an alligator clamp 24 that is connected to the positive terminal 15 of first battery 12. Lead 25 of first cable 22 also terminates in an alligator connector 26

that is connected to negative terminal 16 of first battery 12. Second cable 28 likewise has a pair of leads 29 and 31. Lead 29 terminates in an alligator connector 30 that is connected to the positive terminal 17 of second battery 14. Similarly, lead 31 terminates in an alligator clamp 32 that is releasably connected to negative terminal 18 of second battery 14. Housing 20 contains electromechanical switching circuitry that ensures proper interconnection of the two power sources and, to this end, electrical leads 23, 25, 29 and 31 are electrically connected to this circuitry at ends opposite the respective alligator clamps. With reference to Figure 2, it may be seen that housing 20 includes a switch 34 and a switch control device 36 which determines the condition of switch 34. Switch 34 is preferably a double-pole double-throw (DPDT) switch which has its center contacts 38 and 40 connected to the positive and negative terminals of Power Source "A" (in the form of battery 12). A first set of throw contacts 42 and 44 of switch 34 are connected respectively to the positive and negative terminals of Power Source "B" (in the form of battery 12) while a second set of throw contacts 46 and 48 are cross-connected to first ends of leads 29 and 31. This reverses the electrical communication between the third contacts and the electrical leads 29 and 31 which the switch is moved between switching states. Switch control device 36 is provided to control which pair of throw contacts 42, 44 or 46, 48 are placed respectively in contact with the third set of contacts, designated as center contacts 38 and 40 to define a first and second state for switch 34. That is, a switch control device 36 determines movement or the "throw" of switch 34 and accomplishes it in a manner that automatically puts the desired polarity in a connection between the two power sources. This condition may be referred to as the "coupled state" for the two power sources.

Where electromechanical device 10 is employed as a jumper cable for vehicle or watercraft use, it is desired that the two power sources, such as batteries 12 and 14 be

interconnected so that like polarities are in electrical communication to one another. Accordingly, for sake of explanation, a first exemplary embodiment of the present invention is shown in Figure 3 for connection to two power sources in the form of batteries 12 and 14 so that like polarities are interconnected as the coupled state. In Figure 3, it may be seen that switch control device 36 is in the form of a plurality of current carrying coils which each produce associated magnetic fields so that the array of coils establishes a composite magnetic field that controls a position of an actuator for switch 34.

In the first exemplary embodiment, a center coil 50 is wound counterclockwise and is in electrical communication with leads 23 and 25 respectively by way of leads 53 and 55. Center coil 50 is interposed in spaced relation between a pair of outer coils 60 and 62 with first outer coil 60 being wound counterclockwise and second outer coil 62 being wound clockwise. Coils 60 and 62 are electrically interconnected to one another by electrical lead 64 and may preferably be wound from a common strand of wire. Coils 60 and 62 are in turn interconnected to leads 29 and 31, respectively, by leads 63 and 65. As noted above, leads 23 and 25 have first ends that are connected, respectively, to contacts 38 and 40 of switch 34. Lead 63 is connected to contacts 42 and 48 of switch 34, and lead 65 is connected to contacts 44 and 46 of switch 34.

Preferably, coils 50, 60 and 62 are formed by spools which have hollow cores and about which a spiral winding of wire is supported. For example, center or inner coil 50 includes a spool 52 having a longitudinally extending central bore 54 therethrough. Outer coil 60 includes a spool 66 having a longitudinally extending bore 67 extending therethrough while coil 62 includes a spool 68 having a longitudinally extending bore 69 extending therethrough. Coils 50, 60 and 62 are preferably longitudinally aligned with one another along a common coil axis "X" so that bores 54, 67 and 69 are aligned with one another.

Switch 34 includes an actuator 70 that extends through bores 54, 67 and 69. In the first exemplary embodiment, actuator 70 is secured to spool 52 so that movement of coil 50 to the left or right as shown in Figure 3 causes actuator 70 to move to the left or right respectively. Coils 60 and 62 are fixed with respect to the housing 20, in any convenient manner, and actuator 70 is spring biased by means of centering springs 72 and 74 acting, for example, against sidewall 21 of housing 20 so as to maintain actuator 70 in a neutral position wherein there is no electrical communication between contacts 38, 40 and any of contacts 42, 44, 46 and 48. Electrical communication only occurs when a connection is made to the power sources.

This neutral position is diagramed in Figure 4(a). Here, it may be seen that center coil 50 is equidistantly positioned between outer coils 60 and 62 such that actuator 70 is in a neutral position. When actuator 70 is in the neutral position, it may be seen that the poles associated with pole contacts 38 and 40 do not make electrical communication with any of contacts 42, 44, 46 or 48. Electromechanical switch device 10 is thus in a neutral state prior to interconnection with a power source.

However, with reference to Figures 4(b)-4(e), it may be seen that, when electromechanical switching device 10 is connected between two power sources, it automatically operates to establish electrical communication between like terminals of the power sources. Thus, for example, in Figure 4(a), the connection of leads 23 and 25 to the positive and negative terminals of a power source creates a circuit through center coil 50 so that it has a north and south magnetic poles, with these poles being respectively designated as "N" and "S". Correspondingly, contact 40 is negatively biased while contact 42 is positively biased. When leads 29 and 31 are respectively connected to the positive and negative terminals of a second power source an electrical circuit is established between outer coils 60 and 62 which generate associated

magnetic poles. Here, due to their opposite winding, coils 60 and 62 have south poles opposed to or facing one another and north poles outwardly opposite one another. As a result, coil 50 is repelled from coil 60 and attracted to coil 62. Coil 50 thus moves to the right as is shown in Figure 4(b), and actuator 70 toggles switch 34 so that contact 40 is placed in electrical communication with contacts 44 and 46 while contact 38 is placed in electrical communication with contact 42. Thus, the positive terminals of the two power sources are in electrical communication with one another and the negative terminals of the two power sources are in electrical communication with one another. Correspondingly, contact 42 is positive while contacts 44, 46 are negatively biased.

If the connection to each of the power sources is reversed, as is shown in Figure 4(c), a similar circuit configuration results. Here, leads 23 and 25 are respectively connected to the negative and positive terminals of the first power source while leads 29 and 31 are respectively connected to the negative and positive terminals of the second power source. This reverses the magnetic poles for each of coils 50, 60 and 62. However, due to this reversal, coil 50 still shifts to the right by being attracted to coil 62 and being repelled from coil 60. Actuator 70 again moves to the right placing electrical contact 38 in communication with electrical contact 42 and electrical contact 40 in communication with contacts 44 and 46. However, since the electrical bias of each of the contacts is reversed, once again the positive terminals of the two power sources are in communication as are the negative terminals.

With reference to Figure 4(d), the electrical connection to the first power source by leads 23 and 25 are the same as that shown in Figure 4(b). Here, however, the electrical connection of leads 29 and 31 are reversed so that lead 29 is connected to the negative terminal of the second power source and lead 31 is connected to the positive terminal. When so connected, coil 50 has its magnetic polarity the same as that

shown in Figure 4(d). However, each of coils 60 and 62 are reversed so that now the north poles face one another with the south poles opposite one another. Accordingly, coil 50 will be attracted to coil 60 and repelled by coil 62. Coil 50 and actuator 70 thus move to the left as is shown in Figure 4(d). This places electrical contact 38 in communication with contacts 44, 46 and electrical contact 40 in communication with electrical contact 48. Since electrical contacts 44 and 46 are positively biased, and since electrical contact 48 is negatively biased, with respect to the second power source, the positive polarities of each of the power sources are again in communication as are the negative terminals.

Finally, in Figure 4(e), the electrical connection of leads 29 and 31 to the second power source are the same as shown in Figure 4(b). Here, however, the electrical connection of leads 23 and 25 are reversed with respect to the first power source with lead 23 being connected to the negative terminal and lead 25 being connected to the positive terminal. Accordingly, in comparison with Figure 4(b), the magnetic polarity of coil 60 and 62 remains the same while the magnetic polarity of coil 50 is reversed. In this configuration, coil 50 is attracted to coil 60 and repelled by coil 62, thus causing it and actuator 70 to move to the left. Again, contact 38 is placed in electrical communication with contacts 44, 46 while contact 40 is electrically in communication with contact 48. Since leads 23 and 25 are reversed, however, contact 38 is negatively biased and contact 40 is positively biased with respect to the second power source. Accordingly, matching polarity is again achieved.

While the present invention has been described with respect to an electromechanical switching device that is operative to automatically ensure that like terminals of two power sources are placed in communication, such as would be desirable for an automobile "jumper cable", the ordinarily skilled person in this field would recognize that the exemplary embodiments shown in Figures 1-4 could be modified

to ensure that opposite polarity terminals of two power sources are automatically placed in communication. Thus, with reference to Figure 5, it may be seen that merely the reversing of the winding of coil 50 is all that is required to accomplish this task. Figure 5 may readily be compared to Figure 4(b) to determine that an opposite result occurs by this reverse winding of coil 50. Here, when leads 23 and 25 are respectively connected to the positive and negative terminals of a first power source, the magnetic polarity of coil 50 is reversed so that its north pole is located on the left side and the south pole is located on the right side. When leads 29 and 31 are connected, a polarity of coil 60 and 62 are the same as that shown in Figure 4(b). As a result of reversing the polarity of coil 50, though, coil 50 is attracted to coil 60 and repelled by coil 62. Thus, coil 50 and actuator 70 move to the left. This toggles switch 34 so that contact 38 is placed in electrical communication with contacts 44 and 46 while contact 40 is placed in communication with contact 48. Thus, in a positive terminal of the first power source is connected to the negative terminal of the second power source and the negative terminal of the first power source is connected to the positive terminal of the second power source. A similar result of connecting opposite polarities would occur for the other possible connection states, as well.

Moreover, it should be appreciated that, in the embodiment shown in Figures 1-5, coils 60 and 62 are held stationary, while coil 50 and actuator 70 translate between coils 60 and 62. It should be understood, though, that coil 50 could be stationary and the structure provided so that coils 60 and 62 translate along with the actuator 70. Also, as described below, it is possible that all three coils 50, 60 and 62 be held stationary while translating only the actuator 70.

A third alternate embodiment of the present invention is shown in Figures 6-8 where an electromechanical switching

device 110 employs a solenoid 135 as switch control device 136. Here again, electromechanical switching device 110 includes a pair of leads 123, 125 which are adapted to interconnect to a first power source such as battery 112. A second pair of leads 129 and 131 are likewise provided to connect to a second power source such as battery 114. Leads 123, 125 connect to a central winding 150 of solenoid 135 by means of leads 153 and 155. Leads 123 and 125 are also connected to contacts 138 and 140 respective of switch 134. Lead 129 is connected by lead 163 to a first outer winding 160 of solenoid 135, and outer winding 160 is connected to a second outer winding 162 of solenoid 135 by means of a lead 164. Electrical connection is then made by lead 131 to coil 162 by way of lead 165. Lead 129 also establishes electrical communication to contacts 142 and 148 of switch 134 while lead 131 is in electrical communication with contacts 144 and 146 of switch 134. Centering springs 172 and 174 maintain actuator 170 in a neutral position, for example, against sidewall 121 of the housing for electromechanical switch 110.

Thus, it should be appreciated that the structure of the third exemplary embodiment shown in Figure 6 is identical with respect to the embodiment shown in Figures 1-4 except that a single solenoid 135 having multiple windings replaces coils 50, 60 and 62. Here, also, it should be appreciated that actuator 170 includes as a portion thereof a magnetic permeable material such that actuator 170 translates axially within solenoid 135. Thus, solenoid 135 remains stationary within the housing while actuator 170 interacts with switch 134 to change to the electrical state thereof.

The structure of solenoid 135 may best be seen in reference to Figures 7 and 8. Solenoid 135 is preferably about 2.5-3.0 inches (6.3-7.6 cm) long and 1.0-1.25 inches (2.5-3.2 cm) in diameter. Here, it may be seen that coil 150 is wound on an insulated spool 178 while coils 160 and 162 are respectively wound on insulating spools 180 and 182. Spools 178, 180 and 182 are preferably formed of an insulating

material, such as plastic. Spool 178 is separated from each of spools 180 and 182 by means of a spacer or washer 184 preferably formed of a magnetic permeable material such as soft iron. A pair of end caps 186 and 188 enclose opposite ends of solenoid 135 with the end caps formed of a magnetic permeable material, again such as soft iron. With this construction, end caps 186 and 188 get polarized, respectively, by coils 160 and 162. End caps 186 and 188 have inwardly facing conic surfaces 187 and 189.

Actuator 170 includes an elongated rod 172 which extends axially through solenoid 135 and is in the form of a cylindrical rod made from metallic material, such as stainless steel. A core 190 is positioned centrally in cavity 192 formed between end caps 186, 188 and spools 178, 180 and 182. Core 190 is formed of a magnetic permeable material, such as soft iron that reacts to the magnetic fields generated by solenoid 135, and has opposite frustoconical ends 197 and 199 configured similarly to surfaces 187 and 189. Rod 172 is secured to core 190 by means of suitable clips 194 so that rod 172 and core 190 translate together as a single unit.

From this description, it should be appreciated that coils 150, 160 and 162 perform a similar function as coils 50, 60 and 62. Here, however, the shifting of actuator 170 to the left or right occurs as a result of the interaction of the magnetic permeability of core 190. Actuator 170 thus actuates switch 134 similarly to that described with respect to switch 34.

From the foregoing, it should be appreciated that the present invention also includes a method having shown desired electrical interconnection automatically between a pair of power sources where each of the power sources includes a positive terminal and a negative terminal. This method is accomplished by the structure described above, but broadly includes the first step of producing a first magnetic field associated with a first one of the power sources and producing a pair of second magnetic fields associated with a second one

of the power sources. Finally, the broad method includes actuating a switch in response interaction between the first magnetic field and the second magnet fields thereby to establish electrical interconnection between the desired terminals of the power sources.

This method preferably includes the step of actuating the switch so as to establish electrical interconnection between the like terminals of the power sources. The step of producing the first and second magnetic fields is accomplished by electrically interconnecting the positive terminal and negative terminal associated with a first one of the power sources to a first current-carrying coil and electrical interconnecting the oppositely polarized terminals associated with a separate one of the power sources to a pair second current-carrying coils in a manner such that the second magnetic fields are oriented oppositely with respect to one another. The method then includes interposing the first current-carrying coil between the second current-carrying coils in spaced relation and actuating the switch in response to relative movement between the first and second coils.

Accordingly, the present invention has been described with some degree of particularity directed to the exemplary embodiment of the present invention. It should be appreciated, though, that the present invention is defined by the following claims construed in light of the prior art so that modifications or changes may be made to the exemplary embodiments of the present invention without departing from the inventive concepts contained herein.

I claim:

1. An electromechanical switching device operative to electrically interconnect a positive terminal of a first power source to a selected one of a positive and negative terminal of a second power source and a negative terminal of said first power source to another one of the positive and negative terminals of said second power source thereby to define a selected coupled state for the first and second power sources, comprising:

(a) a switch including a first pair of contacts, a second pair of contacts and a third pair of contacts, said switch movable between a first state wherein each of said third pair of contacts is placed in electrical communication with a respective one of said second pair of contacts and a second state wherein each of said third pair of contacts is placed in electrical communication with a respective one of said second pair of contacts;

(b) a first pair of electrical leads having first ends each respectively connected to a selected one of said first pair of contacts and to a selected one of said second pair of contacts in a configuration such that electrical communication between each of said third electrical contacts and said first pair of electrical leads is reversed when said switch moves from said first state to said second state, said first pair of electrical leads having second ends adapted to connect respectively to the positive and negative terminals of one of said first and second power sources;

(c) a second pair of electrical leads having first ends each respectively connected to a selected one of said third contacts and second ends adapted to connect respectively to the positive and negative terminals of another of said first and second power sources; and

(d) a switch controller including a plurality of current-carrying coils in electrical communication with said first and second pairs of electrical leads and an actuator coupled to said switch, said current carrying coils operative

upon connection of the second ends of said first and second pairs of leads to said first and second power sources to produce a composite magnetic field, said coils arranged such that said actuator interacts with said composite magnetic field to automatically move said switch into whichever one of said first and second states that interconnects said first and second power sources in the selected coupled state regardless of the respective connections of the second ends of said first and second pairs of leads to the positive and negative terminals of said first and second power sources.

2. An electromechanical switching device according to claim 1 wherein said switch is a double pole double throw switch.

3. An electromechanical switching device according to claim 1 wherein said switch controller includes an inner coil interposed between a pair of outer coils, said inner and outer coils movable with respect to one another as a result of magnetic interaction therebetween when current flows therethrough, said actuator secured to one of the inner and outer coils for common movement therewith.

4. An electromechanical switching device according to claim 1 wherein said switch controller includes an inner coil interposed and movable between fixed first and second outer coils, said actuator secured to said inner coil for common movement therewith.

5. An electromechanical switching device according to claim 4 wherein said first and second coils are spiral wound in opposite directions with respect to a common coil axis and are electrically interconnected so that, when current is passed therethrough, said first and second coils respectively produce magnetic fields having a common polarity opposed to one another.

6. An electromechanical switching device adapted for use with a pair of power sources each including a positive terminal and a negative terminal, said electromechanical switching device operative to establish electrical

communication between like terminals of the power sources, comprising:

(a) a plurality of current-carrying coils each adapted to electrically connect in a selected connection state to the oppositely polarized terminals associated with a respective one of said power sources to produce an associated magnetic field so that a composite magnetic field is established; and

(b) a switch magnetically coupled to said coils and operative when said coils are connected to the power sources to interact with the composite magnetic field thereby to interconnect the like terminals of the power sources irrespective of the selected connection state of said coils.

7. An electromechanical switching device according to claim 6 wherein said switch includes an actuator and a plurality of switch contacts.

8. An electromechanical switching device according to claim 6 wherein said electromechanical switching device consists of three said coils.

9. An electromechanical switching device according to claim 8 wherein said coils are positioned about and are aligned along a longitudinally extending coil axis.

10. An electromechanical switching device according to claim 9 including a pair of longitudinally spaced apart outer coils and an inner coil interposed therebetween in spaced relation from each of said outer coils.

11. An electromechanical switching device according to claim 10 wherein each of said coils includes a spool and a spiral winding of wire supported thereon.

12. An electromechanical switching device according to claim 10 wherein said outer coils are wound in opposite directions.

13. An electromechanical switching device according to claim 10 wherein said outer coils are wound with a common piece of wire.

14. An electromechanical switching device according to claim 7 wherein said coils are aligned along a longitudinally

extending coil axis, said actuator extending through said coils along the coil axis and operative to move longitudinally therealong when said switch interacts with the composite magnetic field.

15. A method of ensuring desired electrical interconnection automatically between a pair of power sources, wherein each of said power sources includes a positive terminal and a negative terminal, comprising the steps of:

(a) producing a first magnetic field associated with a first one of said power sources;

(b) producing a pair of second magnetic fields associated with a second one of said power sources; and

(c) actuating a switch in response to interaction between said first magnetic field and second magnetic fields thereby to establish electrical interconnection between the desired terminals of said power sources.

16. The method according to claim 15 wherein the step of producing said first magnetic field is accomplished by electrically interconnecting the positive terminal and the negative terminal associated with a first one of said power sources to a first current-carrying coil, and wherein the step of producing said second magnetic fields is accomplished by electrically interconnecting the oppositely polarized terminals associated with a second one of said power sources to a pair of second current-carrying coils in a manner such that the second magnetic fields are oriented oppositely with respect to one another.

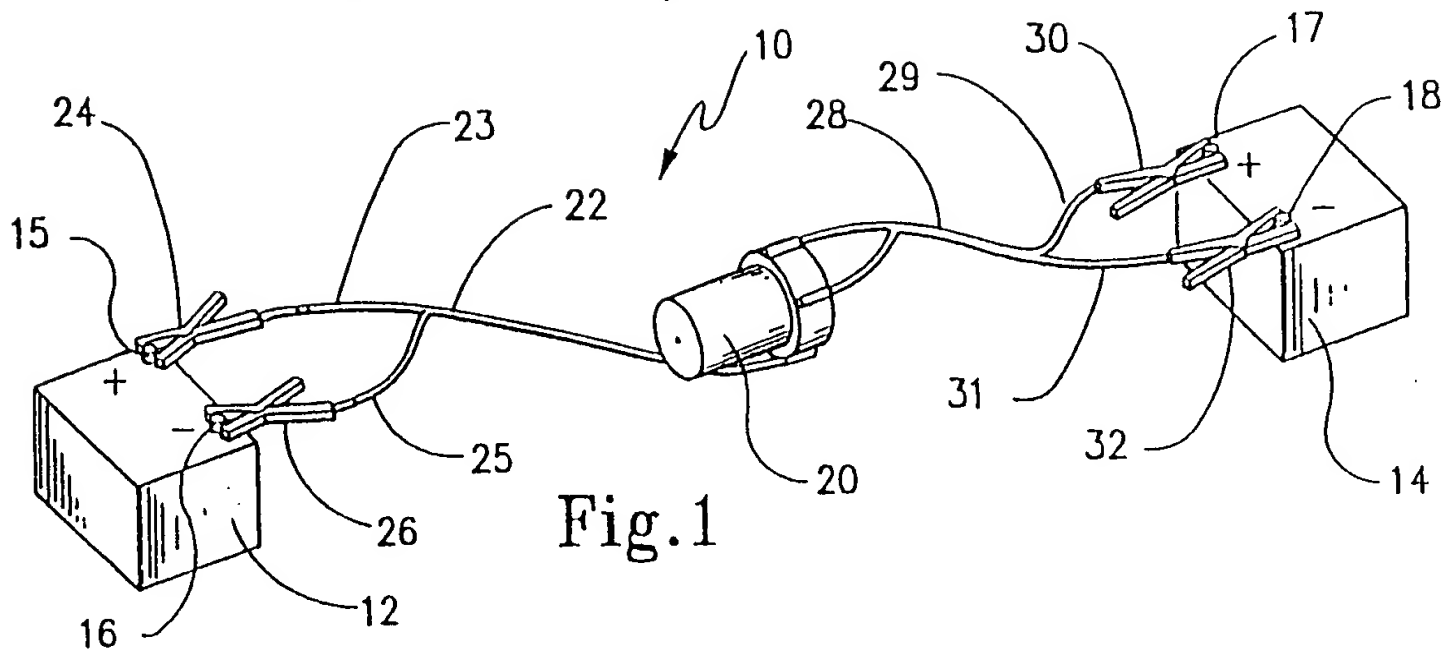


Fig.1

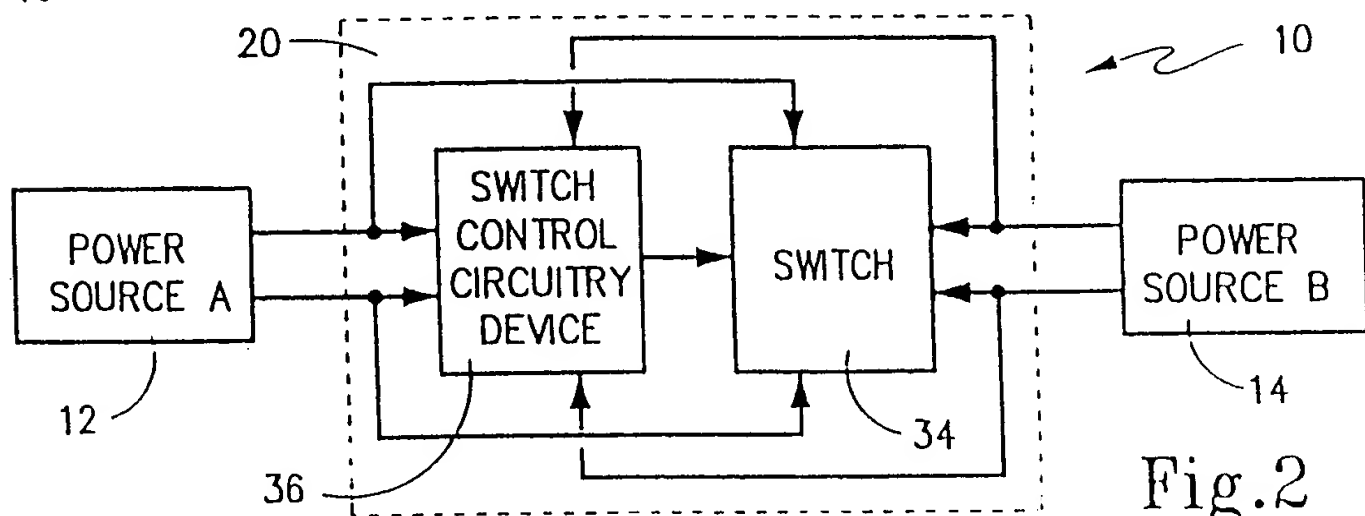


Fig.2

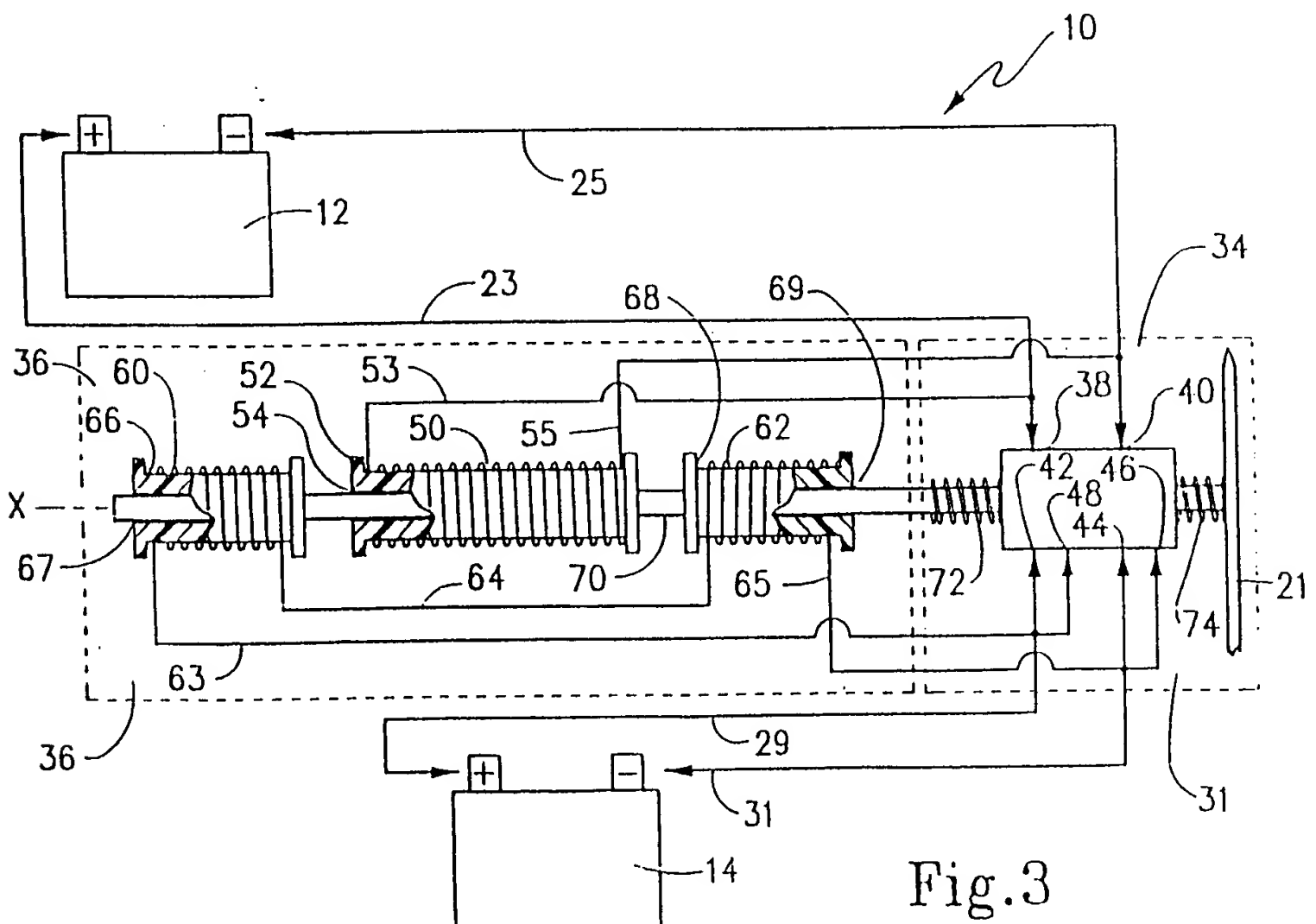


Fig.3

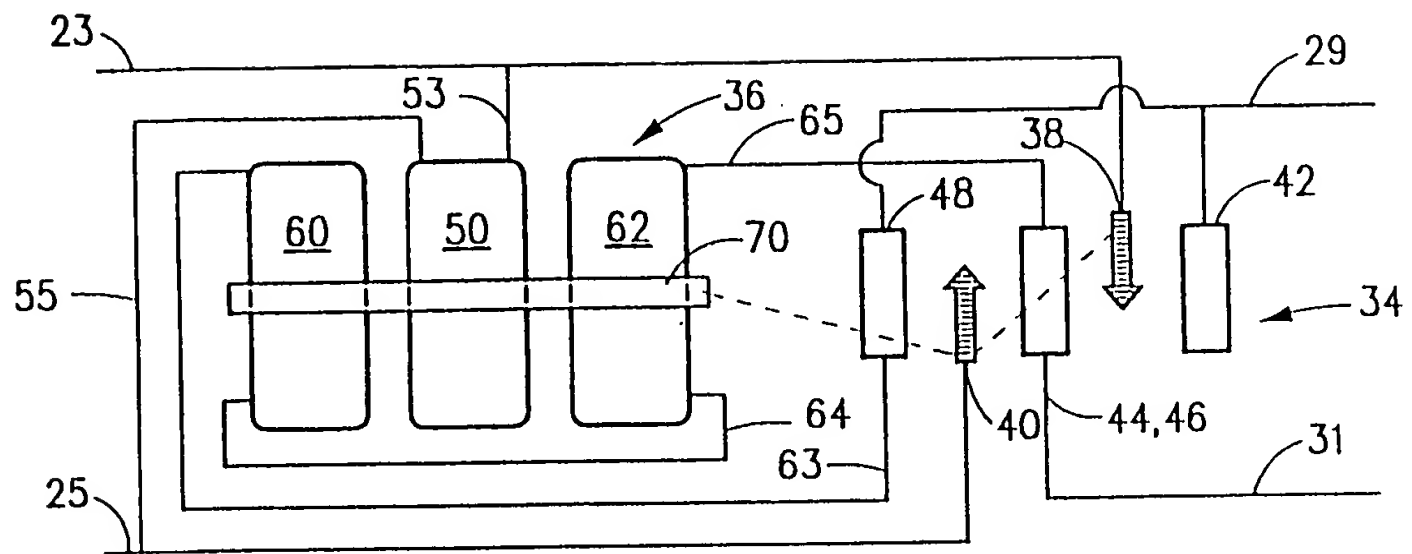


Fig.4a

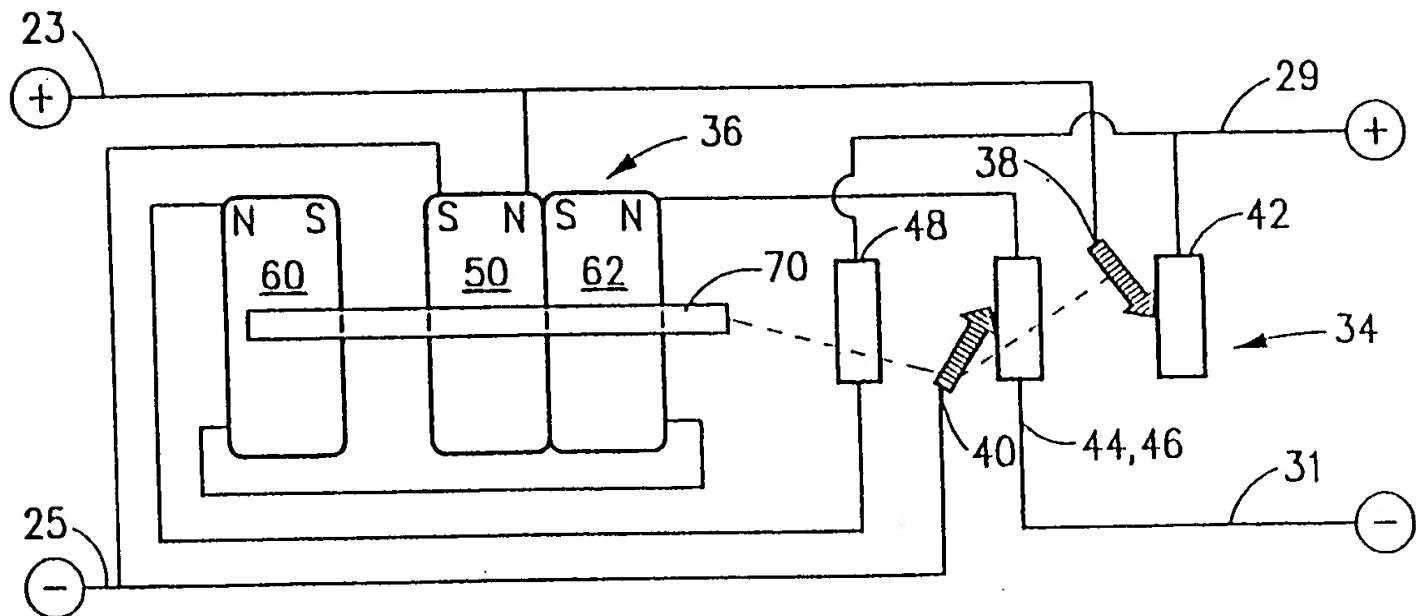


Fig.4b

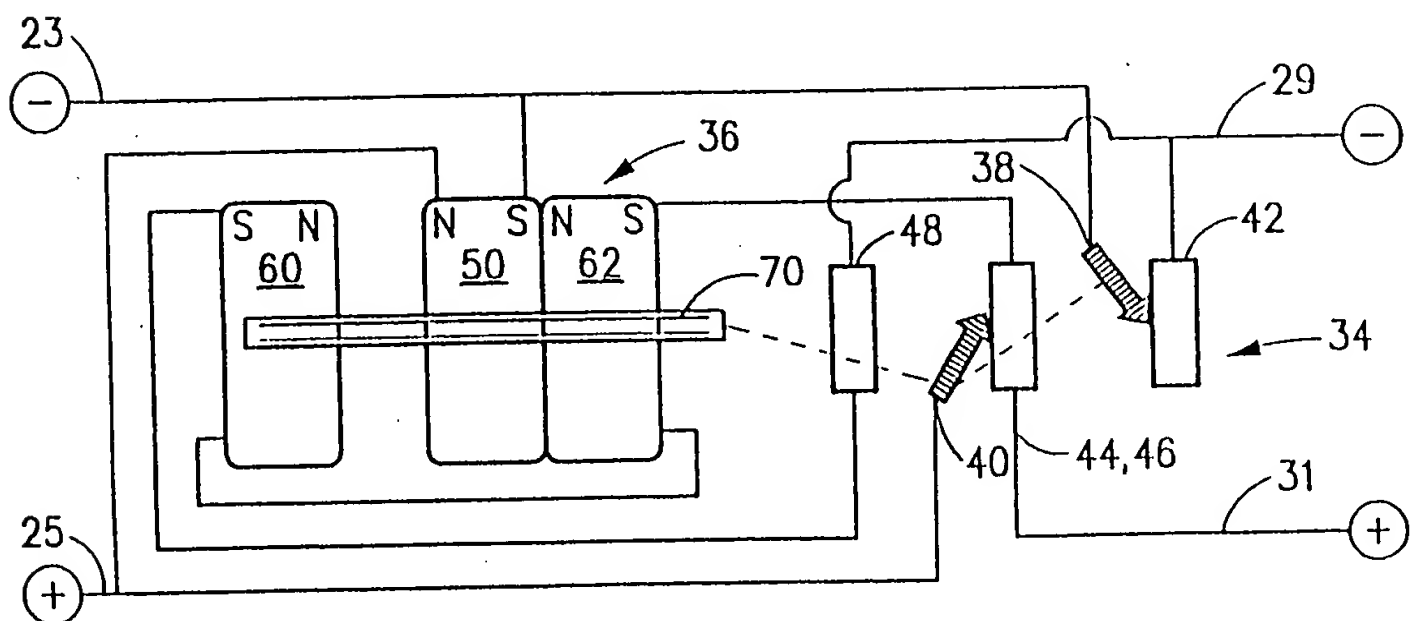


Fig.4-c

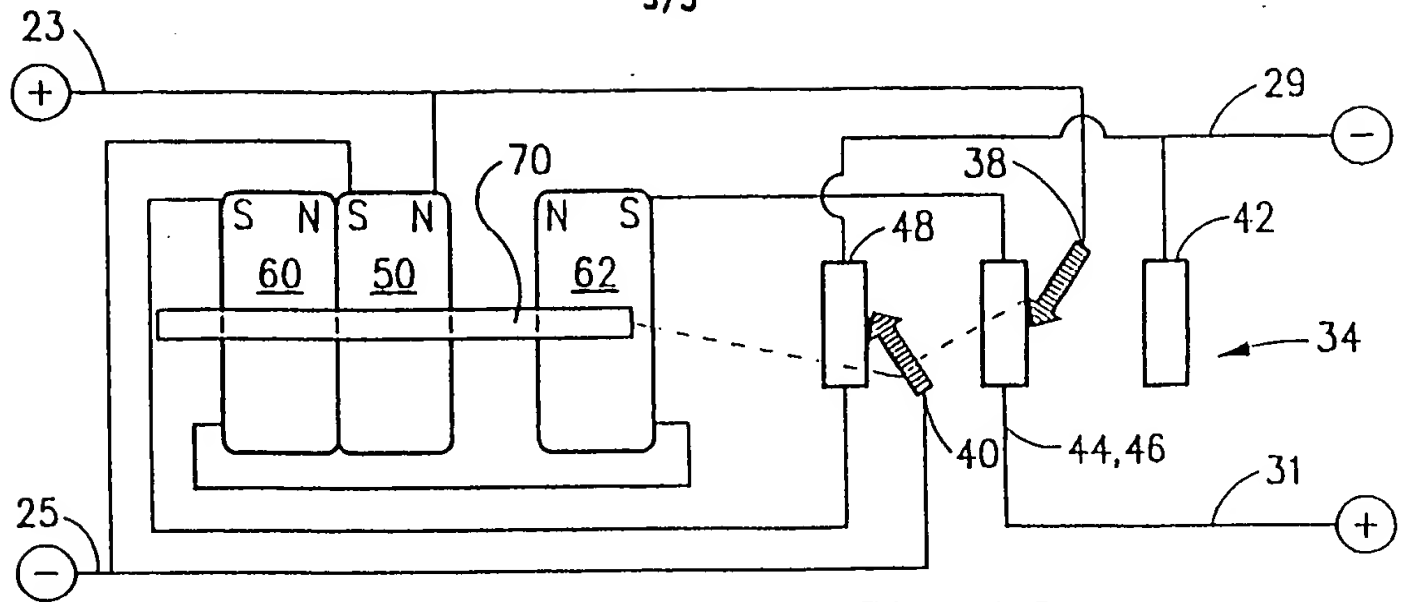


Fig. 4d

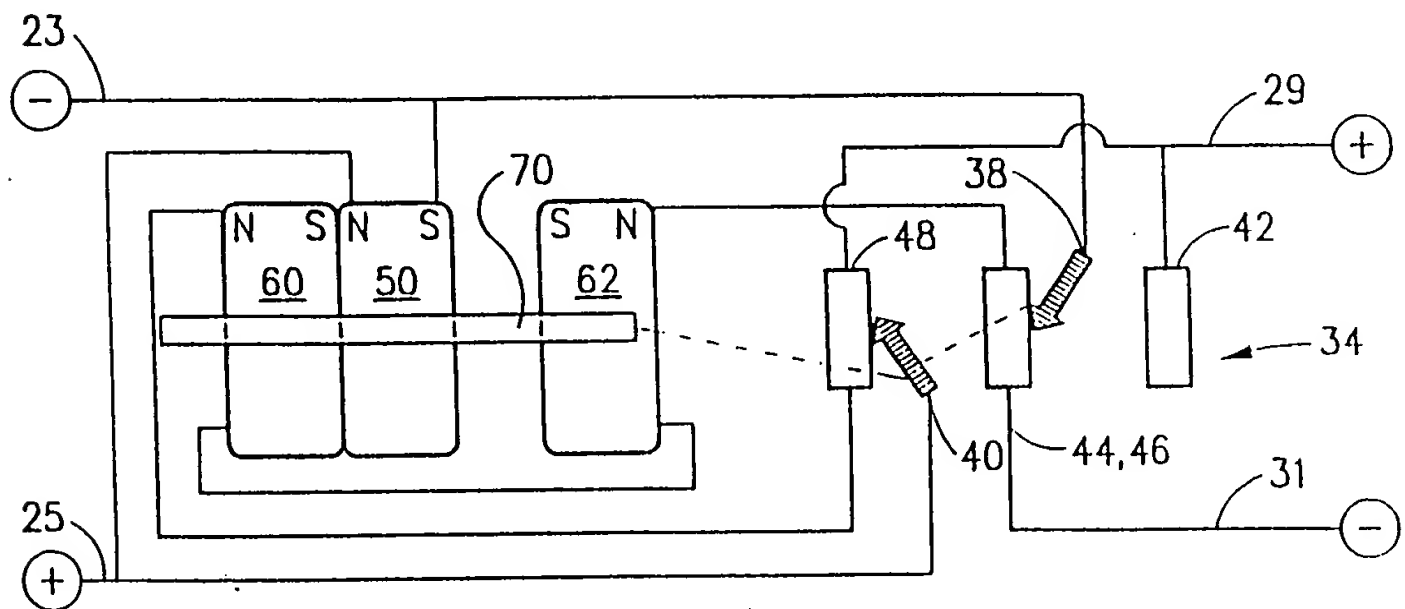


Fig. 4e

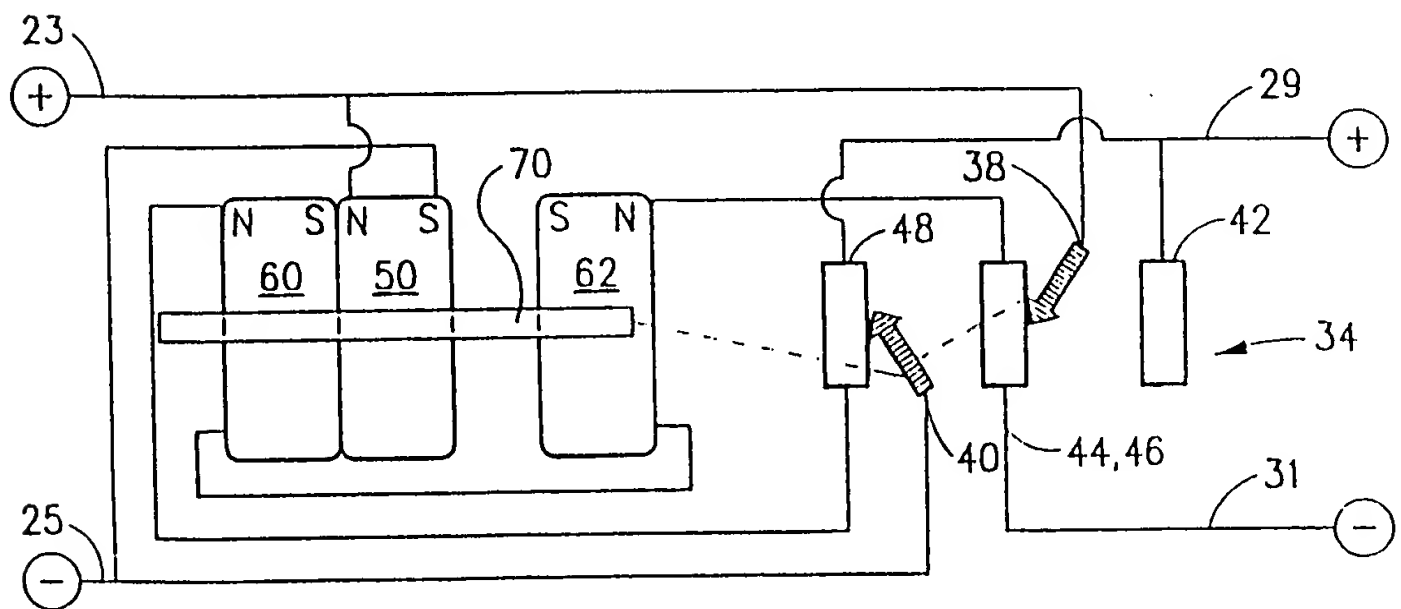


Fig. 5

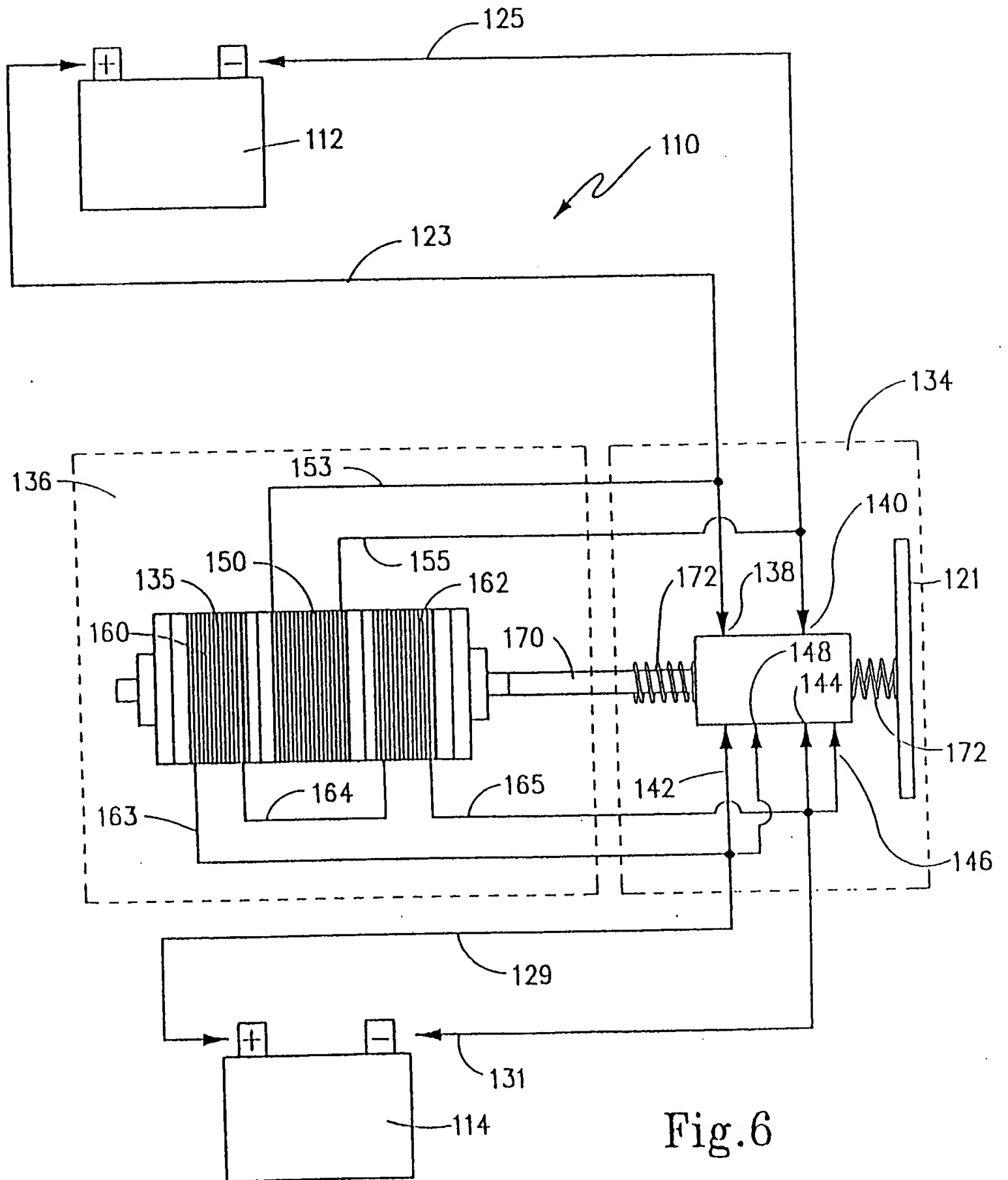


Fig.6

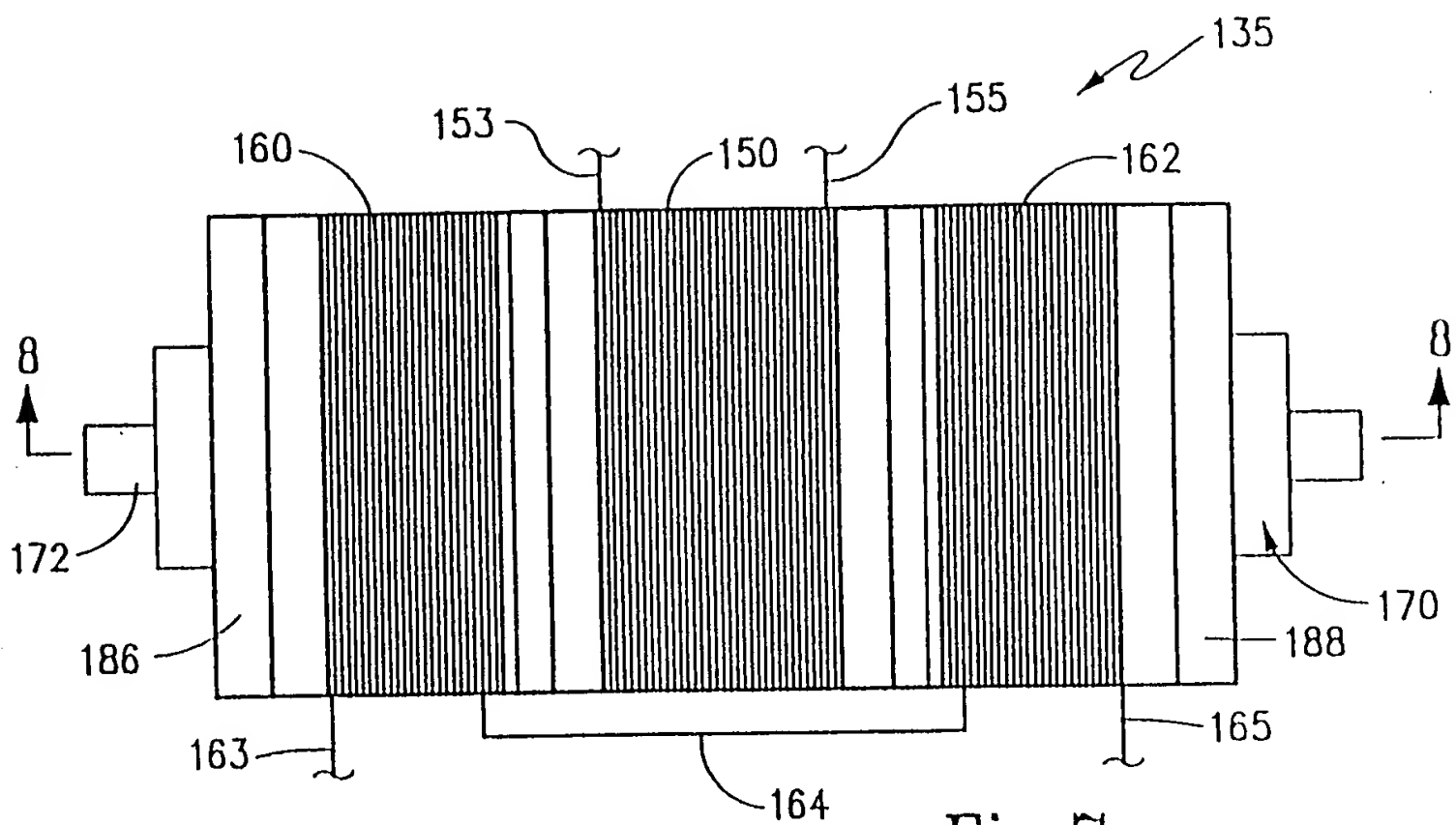


Fig. 7

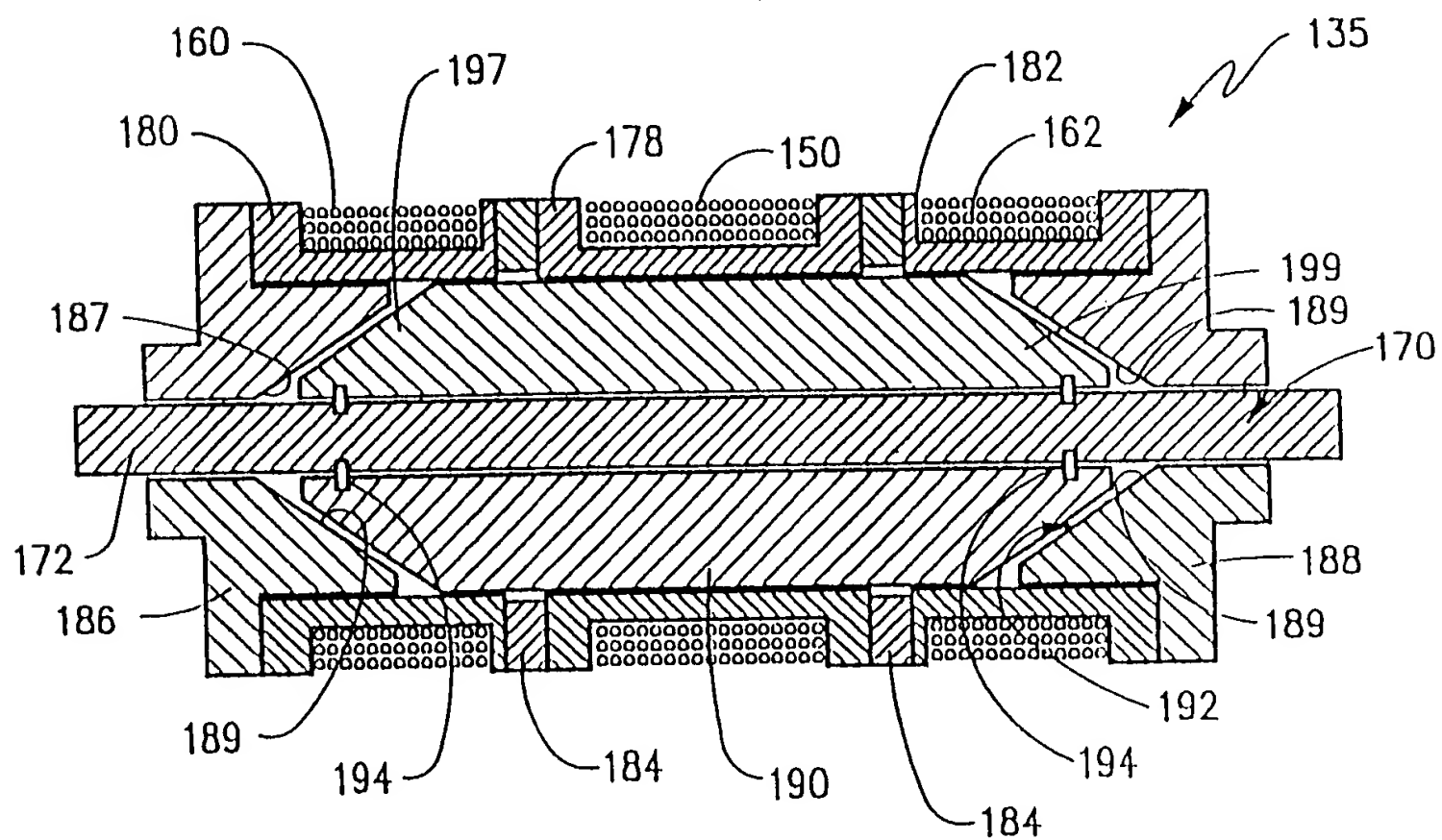


Fig. 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/12310

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : H02B 1/24

US CL : 307/127

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 307/127, 10.1, 10.7, 9.1, 130, 131, 10.8, 134, 138; 361/84, 82, 77, 79, 42, 246, 245; 320/25, 26; 340/636;

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,539,610 A (WILLIAMS ET AL) 23 JULY 1996 (23/07/96), FIG.1-4.	1-14
Y	US 4,471,400 A (REZA) 11 SEPTEMBER 1984 (11/09/84), FIG. 1.	1-14
Y	US 4,520,419 A (LOCHER ET AL) 28 MAY 1985 (28/05/85), FIG 1.	1-14
Y	US 4,857,985 A (MILLER) 15 AUGUST 1989 (15/08/89), FIG 1-2	1-14

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
A document defining the general state of the art which is not considered to be of particular relevance	*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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O document referring to an oral disclosure, use, exhibition or other means	
P document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

10 OCTOBER 1997

Date of mailing of the international search report

12 NOV 1997

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PCT International Application No.: :
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Washington, D.C. 20231

Sir:

Please find enclosed for filing a oath and declaration, transmittal letter to the United States designated/elected office concerning a filing under 35 U.S.C. 371 with the National fee and a verified statement claiming small entity status – independent inventor. Also enclosed is check no. 13173 in the amount of \$395.00 for the National filing fee. The Commissioner is hereby authorized to charge any deficiency in the payment of the required fee(s) or credit any overpayment to Deposit Account No. 13-1940.

If you have any questions concerning this matter, please contact the undersigned attorney.

Respectfully submitted,

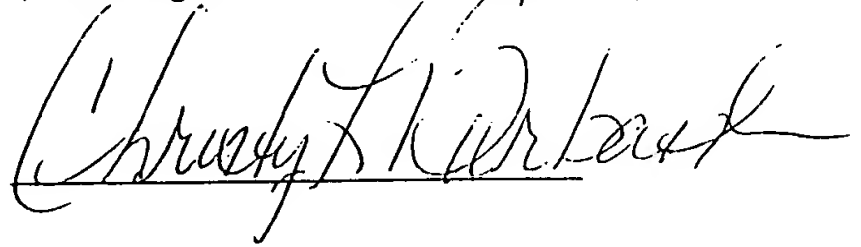
TIMOTHY J. MARTIN, P.C.

By: 


Timothy J. Martin, #28,640
Michael R. Henson, #39,222
Mark H. Weygandt, #43,260
9250 W. 5th Avenue, Suite 200
Lakewood, Colorado 80226
(303) 232-3388

CERTIFICATE OF MAILING UNDER 37 C.F.R. 1.10

I hereby certify that the foregoing **TRANSMITTAL OF NATIONAL FEES OATH AND DECLARATION AND SMALL ENTITY STATUS** and check no. 13173 in the amount of \$395.00 is being deposited with the United States Postal Service as **EXPRESS MAIL, LABEL NO. EE878255861US**, The Assistant Commissioner of Patents and Trademarks Office, Box PCT, Washington, D.C. 20231, on this 17th day of December, 1998.



FORM PTO-1390 (REV. 1-98)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		ATTORNEY'S DOCKET NUMBER DN 1627 PCT	
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371				U.S. APPLICATION NO. (If known, see 37 CFR 1.5)	
INTERNATIONAL APPLICATION NO. PCT/US97/12310		INTERNATIONAL FILING DATE 09.07.1997		PRIORITY DATE CLAIMED 60/021,435	
TITLE OF INVENTION ELECTROMECHANICAL SWITCHING DEVICE					
APPLICANT(S) FOR DO/EO/US Jerry R. Smith					
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:					
<p>1. <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371.</p> <p>2. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371.</p> <p>3. <input type="checkbox"/> This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).</p> <p>4. <input type="checkbox"/> A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.</p> <p>5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2))</p> <p style="margin-left: 20px;">a. <input type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau).</p> <p style="margin-left: 20px;">b. <input type="checkbox"/> has been transmitted by the International Bureau.</p> <p style="margin-left: 20px;">c. <input checked="" type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US).</p> <p>6. <input type="checkbox"/> A translation of the International Application into English (35 U.S.C. 371(c)(2)).</p> <p>7. <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))</p> <p style="margin-left: 20px;">a. <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau).</p> <p style="margin-left: 20px;">b. <input type="checkbox"/> have been transmitted by the International Bureau.</p> <p style="margin-left: 20px;">c. <input checked="" type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired.</p> <p style="margin-left: 20px;">d. <input type="checkbox"/> have not been made and will not be made.</p> <p>8. <input type="checkbox"/> A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).</p> <p>9. <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).</p> <p>10. <input type="checkbox"/> A translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).</p> <p>Items 11. to 16. below concern document(s) or information included:</p> <p>11. <input type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98.</p> <p>12. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.</p> <p>13. <input type="checkbox"/> A FIRST preliminary amendment.</p> <p style="margin-left: 20px;"><input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment.</p> <p>14. <input type="checkbox"/> A substitute specification.</p> <p>15. <input type="checkbox"/> A change of power of attorney and/or address letter.</p> <p>16. <input type="checkbox"/> Other items or information:</p>					

U.S. APPLICATION NO. (if known, see 37 CFR 1.3)		INTERNATIONAL APPLICATION NO. PCT/US97/12310		ATTORNEY'S DOCKET NUMBER DN 1627 PCT	
17. <input checked="" type="checkbox"/> The following fees are submitted: BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)): Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO \$1070.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO \$930.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$790.00 International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$720.00 International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) \$98.00 ENTER APPROPRIATE BASIC FEE AMOUNT =				CALCULATIONS PTO USE ONLY	
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	\$	
Total claims	16 - 20 =	0	x \$22.00	\$ 0.00	
Independent claims	3 - 3 =	0	x \$82.00	\$ 0.00	
			+ \$270.00	\$	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)				\$	
TOTAL OF ABOVE CALCULATIONS =				\$ 790.00	
Reduction of 1/2 for filing by small entity, if applicable. A Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28).				\$	
SUBTOTAL =				\$ 395.00	
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				\$	
TOTAL NATIONAL FEE =				\$ 395.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +				\$	
TOTAL FEES ENCLOSED =				\$ 395.00	
				Amount to be refunded:	\$
				charged:	\$
a. <input checked="" type="checkbox"/> A check in the amount of \$ <u>395.00</u> to cover the above fees is enclosed.					
b. <input type="checkbox"/> Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.					
c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. <u>13-1946</u> . A duplicate copy of this sheet is enclosed.					
NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.					
SEND ALL CORRESPONDENCE TO: Timothy J. Martin, P.C. 9250 W. 5th Avenue, Suite 200 Lakewood, Colorado 80226 United States of America					
				 SIGNATURE	
				Michael R. Henson NAME	
				39,222 REGISTRATION NUMBER	

PTO/SB/09 (12-97)

Approved for use through 9/30/00. OMB 0651-0031
Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

**STATEMENT CLAIMING SMALL ENTITY STATUS
(37 CFR 1.9(f) & 1.27(b))-INDEPENDENT INVENTOR**Docket Number (Optional)
DN 1627 PCTApplicant, Patentee, or Identifier: Jerry R. SmithApplication or Patent No.: PCT/US97/12310Filed or Issued: July 9, 1997Title: ELECTROMECHANICAL SWITCHING DEVICE

As a below named inventor, I hereby state that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees to the Patent and Trademark Office described in:

- ☐ the specification filed herewith with title as listed above.
- ☒ the application identified above.
- ☐ the patent identified above.

I have not assigned, granted, conveyed, or licensed, and am under no obligation under contract or law to assign, grant, convey, or license, any rights in the invention to any person who would not qualify as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern, or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

- ☒ No such person, concern, or organization exists.
- ☐ Each such person, concern, or organization is listed below.

Separate statements are required from each named person, concern, or organization having rights to the invention stating their status as small entities. (37 CFR 1.27)

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

Jerry R. Smith

NAME OF INVENTOR

NAME OF INVENTOR

NAME OF INVENTOR

Signature of inventor

Signature of inventor

Signature of inventor

Date

Date

Date

Please type a plus sign (+) inside this box → ☐

PTO/SB/01 (12-97)

Approved for use through 9/30/00. OMB 0651-0032
Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63)	Attorney Docket Number	DN 1627 PCT
	First Named Inventor	Jerry R. Smith
	COMPLETE IF KNOWN	
	Application Number	/
	Filing Date	
	Group Art Unit	
<input type="checkbox"/> Declaration Submitted with Initial Filing	OR	<input type="checkbox"/> Declaration Submitted after Initial Filing (surcharge (37 CFR 1.16 (e)) required)
Examiner Name		

As a below named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

ELECTROMECHANICAL SWITCHING DEVICE

the specification of which (Title of the invention)

☐ is attached hereto

OR

☐ was filed on (MM/DD/YYYY) **07/09/1997** as United States Application Number or PCT International Application Number **PCT/US97/12310** and was amended on (MM/DD/YYYY) (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached?	
				YES	NO
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

☐ Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

I hereby claim the benefit under 35 U.S.C. 119(e) of any United States provisional application(s) listed below.

Application Number(s)	Filing Date (MM/DD/YYYY)
60/021,435	07/09/1996

☐ Additional provisional application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

[Page 1 of 2]

Burdon Hour Statement: This form is estimated to take 0.4 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Washington, DC 20231.

Please type a plus sign (+) inside this box → ☐

PTO/SB/01 (12-97)

Approved for use through 9/30/00. OMB 0651-0032

Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

DECLARATION — Utility or Design Patent Application

I hereby claim the benefit under 35 U.S.C. 120 of any United States application(s), or 365(c) of any PCT International application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application.

U.S. Parent Application or PCT Parent Number	Parent Filing Date (MM/DD/YYYY)	Parent Patent Number (If applicable)

☐ Additional U.S. or PCT international application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.As a named inventor, I hereby appoint the following registered practitioner(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith: ☐ Customer Number OR

Place Customer Number Bar Code Label here

☒ Registered practitioner(s) name/registration number listed below

Name	Registration Number	Name	Registration Number
Timothy J. Martin	28,640	Mark H. Weygandt	43,260
Michael R. Henson	39,222		

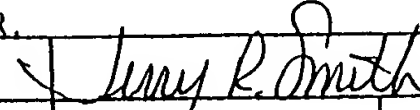
☐ Additional registered practitioner(s) named on supplemental Registered Practitioner Information sheet PTO/SB/02C attached hereto.Direct all correspondence to: ☐ Customer Number or Bar Code LabelOR ☒ Correspondence address below

Name	Timothy J. Martin, P.C.				
Address	9250 W. 5th Avenue, Suite 200				
Address					
City	Lakewood,	State	Co	ZIP	80226
Country	U.S.A.	Telephone	(303) 232-3388	Fax	(303) 232-3288

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Name of Sole or First Inventor:

☐ A petition has been filed for this unsigned inventor

Given Name (first and middle (if any))		Family Name or Surname					
Jerr: R.		Smith					
Inventor's Signature				Date	12-4-98		
Residence: City	Littleton,	State	Co	Country	U.S.A.	Citizenship	U.S.A.
Post Office Address	5690 West Rowland Avenue						
Post Office Address							
City	Littleton	State	Co	ZIP	80123	Country	U.S.A.

☐ Additional inventors are being named on the _____ supplemental Additional Inventor(s) sheet(s) PTO/SB/02A attached hereto.

703-305-3628
Annette Short

RE: PATENT FOR APPLICATION FOR J. SMITH
SERIAL NO.: PCT/US97/12310
FILED: JULY 9, 1997
FOR: ELECTROMECHANICAL SWITCHING DEVICE

Serial #
09/202,003

DATE: DECEMBER 7, 1998

ART UNIT:

ACTION: TRANSMITTAL OF U.S. NATIONAL APPLICATION, NATIONAL FEES,
OATH AND DECLARATION, SMALL ENTITY STATUS INCLUDING CHECK NO. 13173
IN THE AMOUNT OF \$395.00 FOR THE NATIONAL FEES.

PLEASE PLACE THE OFFICIAL STAMP OF THE PATENT OFFICE ON THIS CARD AND
RETURN IT TO US FOR OUR FILES TO CONSTITUTE THE ACKNOWLEDGEMENT OF THE
PATENT OFFICE OF RECEIPT OF THE ABOVE-IDENTIFIED ON THE CARD STAMPED.

OUR FILE NO.: 1707.02.15.1 U.S.

63 Rec'd PCT/PTO 07 DEC 1998

File: 1107.02.15.145.

Telephone Log

Client: Smith Date: 2/16/99

Person Spoken With: PTO - Annette Short

Phone No.: (703) 305-3628

RE: Serial No. for application

09/202,003

Notes

@ 10:44 A/m - call again later.

2/17 @ 8:44 A/m

2/19 @ 9:09 A/m

2/26 @ 8:33 - called help desk
Serial # 09/202,003

Further Action: _____

By Whom: _____

When: _____

File No.: _____

File:

1707.02.15.1

Telephone Log

Client:

Smith

Date:

8/31/00

Person Spoken With:

Status Dept.

Katherine Short

3257

Phone No.:

(703)-305-3620 or -3629

RE:

Status

PCT/US97/12310

US # 09/202,003

Notes

~~9/7/00~~ @ 10:57 - A/M no return call

9/7/00 @ 11:12 - A/M no return

@ 2:48 - A/M no return

9/18 @ 11:12 - A/M

(703) 305-3257 - TONY

PCT Central - changed PCT Data Station

PCT Helpdesk will pull file, doesn't show a problem - but doesn't understand why notice of Acceptance hasn't gone out.

Further Action:

By Whom:

When:

File No.:

File: 1707.02.15.1

Telephone Log

Client: Smith Date: 9/23/00
Person Spoken With: Tony Smith (PCT Office)

Phone No.: (703) 308-6314 direct line
RE: Status

Notes

DO/EO ~~(10/2/00)~~

~~Call~~

Donna Green (703) 305-3619

Q: Showing application in production
give 2-3 days call Donna, Re:
Why notice of acceptance has
not been received. - If she
cannot help call Tony back.

Further Action: _____

By Whom: _____

When: _____

File No.: _____

File: 1707.02.15.1

Telephone Log

Client: Smith Date: 9/29/00

Person Spoken With: Donna Green

Phone No.: (703) 305-3619

RE: Status

Notes

9/29 @ 11:22 - R/m - no return call

10/9 @ 10:01 - R/m - no

10/11 @ 9:32 R/m - no return

10/16 @ 11:03 R/m - still no return call

Francine Young
703-305-3662

Petition for Status under 1.181
PTO Error for not sending notice
fax to PCT Legal Dept.

Further Action: _____

By Whom: _____

When: _____

File No.: _____

Fax Petition to PCT Legal Dept.

10-19-00
PCT Fax
703-308-6459

File: 1107.02.15.1

Telephone Log

Client: Smith Date: 10/19/00

Person Spoken With: Tony Smith

Phone No.: (1703) 308-6414 (direct line)

RE: Status

Notes

File Petition for Status under
C.F.R. 1.181

PTD Error for not sending
notice of Acceptance

Send to PCT Legal Dept. by
fax

PCT Fax # (1703) 308-6459

Further Action: _____

By Whom: _____

When: _____

File No.: _____

12-13-00
12-12-00
12-6-00

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

RE: Patent Application for : Date: February 26, 1999
J. Smith : Art Unit:
Serial No.: 09/202,003 : Examiner:
Filed: December 7, 1998 : Action: **TRANSMITTAL OF**
For: **ELECTROMECHANICAL** : **INFORMATION DISCLOSURE**
SWITCHING DEVICE :

TO: The Commissioner of Patents and Trademarks
Washington, DC 20231

Sir:

The document identified on the attached form PTO/SB/08A has come to the attention of the undersigned in connection with the subject application. A copy of this document is also attached, unless otherwise indicated below, and it is respectively requested that it be made of record in this proceeding. The identification of this document is for the purpose of meeting Applicant's duty of disclosure under 37 C.F.R. 1.56 and is not intended to be an admission that this document constitutes prior art as to the invention disclosed in the subject application.

U.S. Patents

<u>Patent No.</u>	<u>Issue Date</u>	<u>Inventor</u>
4,769,586	September 6, 1988	Kazmierowicz

The following documents were discussed in the specification of the application.

U.S. Patents

<u>Patent No.</u>	<u>Issue Date</u>	<u>Inventor</u>
4,400,658	August 23, 1983	Yates
5,103,155	April 7, 1992	Joannou

U.S. Patent No. 4,189,586 to Kazmierowicz relates to a battery starter apparatus for coupling terminals of a battery to a power source. Means are provided for determining the polarity of both the battery and the source of power and thereafter coupling the two while observing proper polarity requirements. To this end, the battery starter apparatus includes a pair of conductors with means for connecting the conductors to a battery thereby causing one of the conductors to be at a higher relative potential and the other of the conductors to be at a lower relative potential due to the polarity of the battery. A control circuit couples the conductors to the power source and includes means for determining the polarity of the battery and thereafter coupling the higher potential conductor to the higher relative voltage means of the power source and the lower potential conductor to the lower relative voltage means of the power source. The battery jumper cable apparatus only permits the battery and the power source to be coupled when the battery voltage exceeds a preselected level. A transfer relay is also utilized to couple the battery to the power source.

The remainder of the patents listed were cited in the background of the present application and also relate to different techniques employed in the past by others to insure proper interconnection between vehicle batteries.

Applicant believes that none of the disclosed art, alone or in combination, fully or fairly discloses the structure or methodology described and claimed in this application. Accordingly, examination of the claims on the merits and allowance of the application as filed are respectfully requested.

Respectfully submitted,

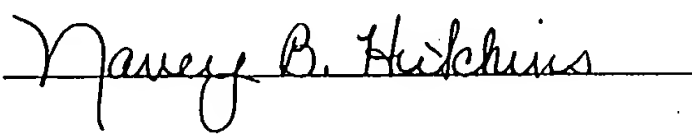
TIMOTHY J. MARTIN, P.C.

By: 

Timothy J. Martin, #28,640
Michael R. Henson, #39,222
Mark H. Weygandt, #43,260
9250 W. 5th Avenue, Suite 200
Lakewood, Colorado 80226
(303) 232-3388

CERTIFICATE OF MAILING UNDER 37 C.F.R. 1.8

I hereby certify that the foregoing **INFORMATION DISCLOSURE INCLUDING PTO/SB/08A FORM AND REFERENCES** is being deposited with the United States Postal Service as first-class mail in an envelope addressed to The Commissioner of Patents and Trademarks Office, Washington, D.C. 20231, on this 01 day of March, 1999.



1674

Burden Hour Statement: This form is estimated to take 2.0 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, DC 20231.

DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Washington, DC 20231.

RE: PATENT APPLICATION FOR J. R. SMITH
SERIAL NO.: 09/202,003
FILED: DECEMBER 7, 1998
FOR: ELECTROMECHANICAL SWITCHING DEVICE



DATE: MARCH 01, 1999

ART UNIT:

ACTION: TRANSMITTAL OF INFORMATION DISCLOSURE, PTO/SB/08A FORM AND
(3) THREE REFERENCES

PLEASE PLACE THE OFFICIAL STAMP OF THE PATENT OFFICE ON THIS CARD AND
RETURN IT TO US FOR OUR FILES TO CONSTITUTE THE ACKNOWLEDGMENT OF THE
PATENT OFFICE OF RECEIPT OF THE ABOVE-IDENTIFIED ON THE CARD STAMPED.

OUR FILE NO.: 1707.02.15.1 U.S.

1707.02.15.1 PCT/PTO 04 MAR 1999

MAR 15 1999

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

RE: Patent Application for : Date: November 13, 2000
Jerry Smith : Group:
Serial No.: 09/202,003 : Examiner:
Filed: December 7, 1998 : Action: **FIRST SUPPLEMENTAL**
For: **ELECTROMECHANICAL** : **INFORMATION DISCLOSURE**
SWITCHING DEVICE :

TO: The Assistant Commissioner of Patents and Trademark Office
Washington, DC 20231


Sir:

On or about March 1, 1999, Applicant's attorney submitted an information disclosure pursuant to 37 C.F.R. §1.56 to the Patent Office in reference to the above-identified patent application. The enclosed documents identified on the attached form PTO/SB/08A have recently also come to the attention of Applicant's attorney and were cited in communications from one or more foreign patent offices in counterpart foreign applications. These documents are being forwarded to the Patent Office pursuant to 37 C.F.R. §1.97(b)(3) as there has yet to be an office action on the merits mailed in this case. Copies of these references are attached and it is respectfully requested that they be made of record in this proceeding. The identification of these document is for the purpose of meeting Applicant's duty of disclosure under 37 C.F.R. §1.56 and is not intended to be an admission that any of these documents constitutes prior art as to the invention disclosed and claimed in the subject application.

<u>Patent No.</u>	<u>Inventor</u>	<u>Issue Date</u>
4,471,400	Reza	September 11, 1984
4,520,419	Locher et al.	May 28, 1985
4,607,209	Guim et al.	August 19, 1986
4,746,853	Ingalls	May 24, 1988
4,857,985	Miller	August 15, 1989
4,994,727	Yang	February 19, 1991
5,539,610	Williams et al.	July 23, 1996

Respectfully submitted,

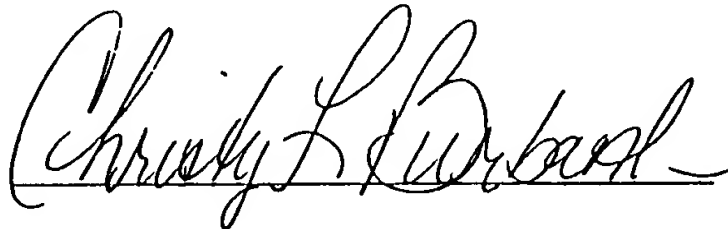
TIMOTHY J. MARTIN, P.C.



Timothy J. Martin, #28,640
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